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ABSTRACT

The purpose of this study was to study recreational reading in third, fourth, and fifth grade urban students in a school district in Southeastern Virginia. The widely-used Accelerated Reader (AR) was the tool examined in the promotion of recreational reading. The major research questions determined if recreational reading, using Accelerated Reader, influenced reading vocabulary, comprehension, and attitude when socioeconomic status was low. Using the pre-experimental design, seven Title I schools in urban Southeastern Virginia participated in pre-testing in September/October 1998 and post-testing in May/June 1999. Two independent variables, each with three levels, were manipulated: Type of AR Usage i.e. low (0-20 points), average (21-74 points), high (75 and above points) and Grade Level i.e. three, four, and five. Dependent variables reading vocabulary and comprehension were measured using the Gates-MacGinitie Tests of Reading, Form L on 755 students. The dependent variable attitude was measured on 515 students who completed The Elementary Reading Attitude Scale (ERAS). Results indicated: (1) the percentage of students testing below grade level for reading vocabulary and comprehension significantly decreased; (2) significant differences existed for type of AR usage and grade level effect; (3) as participation in the AR program increased, the mean score differences also increased; (4) attitude data revealed that only "type of AR usage" was significant; and (5) 51.8% of the sample earned low AR usage status, and below-grade-level readers comprised 33% of this group. Findings suggest that recreational reading, using AR, increases reading vocabulary, comprehension, and attitude, providing it is utilized as intended. (Contains 94 references and 8 tables of data. Appendixes contain data, a list of SAS commands, and general linear models procedures.) (RS)

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AN EVALUATION OF THE ACCELERATED READER PROGRAM IN GRADES 3 - 5 ON READING VOCABULARY, COMPREHENSION, AND ATTITUDE IN AN URBAN SOUTHEASTERN SCHOOL DISTRICT IN VIRGINIA

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A Dissertation submitted to the Faculty of
Old Dominion University in Partial Fulfillment of the
Requirement for the Degree of

DOCTOR OF PHILOSOPHY

URBAN SERVICES
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ABSTRACT

AN EVALUATION OF THE ACCELERATED READER PROGRAM IN GRADES THREE, FOUR, AND FIVE ON READING VOCABULARY, COMPREHENSION, AND ATTITUDE IN AN URBAN SOUTHEASTERN SCHOOL DISTRICT IN VIRGINIA.

Carol Ann Howard
Old Dominion University
December 1999
Chair: Dr. Maurice R Berube

The purpose of this study was to study recreational reading in third, fourth, and fifth grade urban students in a school district in Southeastern Virginia. The widely-used Accelerated Reader (AR) was the tool examined in the promotion of recreational reading. Recreational reading studies have been done on a broad economic spectrum (Advantage Learning Systems, 1997; Paul, 1996; Paul, VanderZee, Rue & Swanson, 1996). A gap in knowledge exists as to whether recreational reading programs, using AR, are effective with the urban elementary students. The major research questions determined if recreational reading, using Accelerated Reader, influenced reading vocabulary, comprehension, and attitude when socioeconomic status was low.

Using the pre-experimental design, seven Title I schools in urban Southeastern Virginia participated in pre-testing in September/October 1998 and post-testing in May/June 1999. Two independent variables, each with three levels, were manipulated: Type of AR Usage i. e. low (0-20 points), average (21-74 points), high (75 and above points) and Grade Level i.e. three, four, and five. Dependent variables reading vocabulary and comprehension were measured using the Gates-MacGinitie Tests of Reading, Form L (Gates-MacGinitie, 1989) on 755 students. The dependent variable attitude was measured on 515 students who completed The Elementary Reading Attitude Scale (ERAS) (McKenna & Kear, 1990).

Positive findings are as follows:

(1) At pretesting 75% or greater of all students tested below grade level in both reading vocabulary and comprehension. At post-testing, after the AR treatment had been administered for the duration of the school year, the percentage of students testing below grade level for reading vocabulary and comprehension significantly decreased.

(2) Results of the Multivariate Analysis of Variance (MANOVA) were significant for Type of AR Usage and Grade Level effect. When descriptive statistics, Type of Reader, were examined, significant differences between pre-test and post-test assessment of vocabulary and comprehension were noted.

(3) Review of the data for the mean difference in vocabulary and comprehension by Grade Level and Type of AR Usage indicated that as participation in the AR program increased, the mean score differences also increased.

(4) An Analysis of Variance (ANOVA) format was used to analyze attitude data revealed that only the "Type of AR Usage" effect was significant.

Negative findings are as follows:

(1) Frequency data indicated that 51.8% of the sample earned low AR usage status, whereas 11.8 % of the students obtained high AR usage during the school year. "Below grade level readers" composed 33% of the "low AR usage" group and only 2% of the "high AR usage" group.

(2) The computation of the mean difference on the ERAS scores may have been affected by statistical regression. Caution in interpretation of results is recommended.

In summary, results of the current study concluded that recreational reading, using AR, increases reading vocabulary, comprehension, and attitude, providing it is utilized as intended. Recommendations to school administrators and researchers are as follows:

(1) Increase Student Participation in recreational reading ensuring proper use of the AR program with a focus on understanding the characteristics and needs of the "below grade level" reader;

(2) Study factors affecting reading performance

I dedicate this dissertation to my family. My husband, Bobby, has always been steadfast in his commitment to me. In truth, without all the sacrifices he made on my behalf, I could not have realized this dream. Our son, Timothy clearly wanted his mother to be happy in this pursuit. Our daughter Sarah, who became seriously ill four years ago, has inspired us all with her courage. And lastly, I dedicate this dissertation to my dear mother Agnes, and late father, Edward, for their love.

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CHAPTER 1

INTRODUCTION

Reading with comprehension is a skill essential to learning and is central to a variety of cultural practices. Historians and anthropologists have documented that reading enables people to participate in the debate of politics, the discourse of science, and the negotiation processes required in business (Gaff, 1987). From a cognitive perspective, reading is defined as a thinking process; from a linguistic perspective, reading is defined as a language process; and from a social perspective, reading is defined as using written language in a social situation for purposeful communication (Vacua, Vacua & Gove, 1987). Vocabulary and reading are closely related (Baker, 1995).

The reader derives meaning from the text and brings to the task a wealth of knowledge and experience (Anthony, Pearson, & Raphael, 1989). In general, good readers possess positive attitudes towards reading while poor readers possess negative attitudes. In addition, students may choose to do poorly in school to gain the acceptance of the peer group (Linek, Sturtevant, Rasinski, & Padrek, 1990).

Although public schooling is designed to be equally accessible and valuable to all children, in practice some sociocultural groups have consistently fared better in the system than others (Laosa, 1984). Lack of money alone is not sufficient to put a child at risk for either academic failure or language problems. It is only when lack of money is associated with inadequate nutrition, inadequate medical care, or unstable living conditions that poverty becomes a risk-factor (Fazio, Naremore & Connell, 1996). Culturally diverse learners were defined as those students who by virtue of their instructional, experiential, cognitive,

socieconomic, linguistic, and physiological backgrounds bring different and often additional requirements to traditional instruction and curriculum (Baker, 1995a). For the purposes of this study, the terms at-risk learner, culturally diverse learner, disadvantaged, and low socio-economic status students are interchangeable.

The promotion of reading achievement by use of recreational reading is the focus of this study. Everett (1987) defined recreational reading as, when given various options, students will choose to read self-selected materials for self-determined purposes. Enjoyment while reading is not subject to teacher-imposed evaluative criteria.

Educators have promoted recreational reading in various ways. Pizza Hut and the U.S. Department of Education, for example, teamed up to offer a nationwide reading incentive program (Kohn, 1995). Many public libraries offer their own summer reading reward programs. A program that combines a literature-based reading program and uses the computer for testing to measure student reading practice is the Accelerated Reader (AR) program (Advantage Learning Systems, 1997). Introduced in 1986 as a tool to help teachers efficiently manage literature-based reading, it provides detailed reports to parents, teachers and administrators on the child's reading progress.

This study will evaluate the effectiveness of the Accelerated Reader program in an urban, at-risk population. The promotion of recreational reading has been linked to improvements in reading abilities in the elementary school population in certain grade levels (Arthur, 1995; Erazmus, 1987; Everett, 1987, Peak & Dewalt, 1994).

The Institute for Academic Excellence (IAE) was founded by Judith and Terrance Paul, creators of the Accelerated Reader (AR) and owners of Advantage Learning Systems.

The first 1993 IAE study of the Accelerated Reader program was conducted with a sample of 10,124 students. Positive correlations between the amount of points students earned in the program and gain scores on standardized tests were noted. Young children of "low reading ability" improved approximately two grade levels for every 100 points earned reading. The reading gains were less in the upper grades, with fifth graders gaining approximately one-half years growth per 100 points. In a second 1993 IAE study approximately 6,000 Texas schools were compared on the basis of ownership of the AR program. The AR schools were divided into three groups according to their socioeconomic status. All results favored the AR schools over non-AR schools when comparing statistical differences for reading comprehension, writing, math, science and social sciences. Similarly, scores for five subject areas were analyzed for several hundred Tennessee grade schools (Paul, Swanson, Zhang, & Hehenberger, 1997). Schools which implemented the Accelerated Reader were compared with schools that had not purchased AR. Schools that owned the AR outperformed others in all grades and subjects. Selection bias may be a contaminant because ownership of the AR program does not guarantee its us.

Patterns of reading practice in a large K - 12 sample similar in ethnic and socio-economic factors to demographic characteristics of the United States using the Accelerated Reader program were examined (Paul, 1996). Key findings indicated that in-school reading practice time declines markedly after fifth grade; students in the top 5 percent read 144 times more than students in the bottom 5 percent and reading practices varies dramatically by the size of the school's population with smaller schools faring better.

In the seven Title I schools studied in a Southeastern urban system eighty percent or

more of students in each school site receive free or reduced lunch, based on household income. Ethnicity is primarily African-American. Therefore, large studies by the IAE on the Accelerated Reader program may or may not pertain to the urban, at-risk learner. Smaller, independent studies (Cameron & Pierce, 1994; McKnight, 1992; McQuillan, 1996; Peak, 1993; Rosenheck, Caldwell, Calkins & Perez, 1996) examined populations that differ from the target population in this study. This study is designed as a vehicle to "close a gap in knowledge" in recreational reading in a homogeneous population of low-income minority children.

Rationale

Research indicates that at-risk, diverse learners are different from privileged minority students in their educational needs (Banks, 1994; Baruth & Manning, 1992). Diverse learners in grades three - five who received Title I benefits in an urban school system participated in the study. Any child that participated in English As a Second Language training, or was enrolled in Special Education was not eligible for the study due to multiple treatment interference concerns. This study sought to expand the research base by studying the effect of the Accelerated Reader program on a diverse, low-socioeconomic status population of elementary at-risk students.

Theoretical Framework

The theoretical framework for this study is based on language and literacy research for the urban, diverse, at-risk learner. Baker (1995 a,b), Fazio, Naremore and Connell (1996), Hart and Risley (1995), Isaac (1996), and Stanovich (1986) explored early language development, vocabulary growth, and language differences of the at-risk learner. Early

literacy experiences, home environment impact, and family literacy modeling dynamics were developed by Hart and Risley (1995), Mason and Allen (1986), Morrow (1983), Ninio (1980), Teal and Sulzby (1986) and others.

Parents influence children's oral language development (Snow, 1977, 1983) and parents' reading habits influence young children (Nino & Bruner, 1978; Snow, 1983; Teale & Sulzby, 1981). In the absence of strong home reading models, teachers must encourage children to become interested in reading (Manna, 1987). Additionally, attitude toward reading can influence reading achievement (Linek, Sturtevant, Rasinski, & Padrek, 1990).

Generally, Americans do not read for recreation, preferring the alternative of television (Purves, 1990); sixty-two percent of nine-year olds watch three or more hours of television per day (Merina, 1992). Absent or otherwise occupied parents seldom model reading behaviors for their children, and this lack of modeling has a negative impact on the growing child. Boys and girls may not understand that reading is valuable because they do not see parents reading on a regular basis (Greene, 1992).

Reading is a skill that requires practice to perfect. Recreational reading programs are designed to encourage the development of the reading habit. The Institute of Academic Excellence promotes the concept of reading practice, in which beginning readers are read books aloud. As students progress, there is an interactive one-on-one assisted reading stage where a student works with an adult or more experienced reader. Finally, students read books silently on their own. Reading, as a social skill, is encouraged by implementing shared activities and reading aloud as well (Paul, 1996).

At the current time, there appears to be a lack of research on recreational reading

programs that involve an emerging population of urban-at risk youth with respect to its effect on reading achievement (Arthur, 1995). Given an effectiveness evaluation, an urban school system can make appropriate decisions about its recreational reading program.

Purpose of the Study

This study will explore the question: How is participation in the Accelerated Reader program related to growth in reading vocabulary, comprehension and reading attitude in an urban elementary school system in the third, fourth and fifth grades?

Socioeconomic status is a compelling link to vocabulary acquisition and vocabulary growth rate; vocabulary limitations characterize the at-risk learner and have lasting effects (Baker, 1995 a,b; Hart & Risley, 1995). Accordingly, the population of interest are the Title I elementary school students in third, fourth, and fifth grades. Reading comprehension and vocabulary development growth were defined as the gain scores obtained in the Gates-MacGinitie Reading Test between September/October 1998 pre-test administration and May/June 1999 post-test administration. Attitude gain scores were defined as the difference in Total Reading scores obtained in pre-test and post-test administration of the Elementary Reading Attitude Survey (McKenna & Kear, 1990) over the same time period.

Hypotheses

Hypothesis 1. There is no difference in mean scores in vocabulary or comprehension as measured by the Gates-MacGinitie Test measured in September/October 1998 and May/June 1999 when Accelerated Reader treatment is administered across three grade levels: third, fourth, and fifth.

Hypothesis 2. There is no difference in mean scores in reading attitude using the

fourth, and fifth.

Hypothesis 2. There is no difference in mean scores in reading attitude using the Elementary Reading Attitude Survey Scale (ERAS) (McKenna & Kear, 1990) measured in September/October 1998 and May/June 1999 when Accelerated Reader treatment is administered across three grade levels: third, fourth, and fifth.

Methods

Population

School sites were selected based upon their volunteer status within the group of Title I schools. The target population was comprised of third through fifth grade at-risk, diverse learners from the lower socioeconomic status in seven Title I schools in an urban system.

Research Design

This study is an example of a one-group pre-test and postest pre-experimental design. The Accelerated Reader program served as the treatment phase. Participation was examined via computerized AR reports to determine individual student AR use. Student's level of participation, i.e. "Type of AR Usage" was divided into three levels: (1) low participation (0 - 20 AR points); (2) average participation (21 - 74 AR points); (3) high participation (75 points and above). A descriptive statistic, "Type of Reader" described two classifications of readers as "below grade level reader" and "on/above grade level reader".

The dependent variables (DV) were measured in pre-testing (September 1998/October 1998) and post-testing (May/June 1999) sessions:

DV (A) Gates-MacGinitie (MacGinitie & MacGinitie, 1989) Vocabulary score

DV (C) Elementary Reading Attitude Scale (ERAS) (McKenna & Kear, 1990) score

DV (A) and (B) were analyzed in a Multivariate Analysis of Variance (MANOVA) format to test Hypothesis 1 using 755 observations for analysis. Due to the fact that fewer observations were available for analysis of DV (C) i.e. N = 515, a separate Analysis of Variance was used to test Hypothesis 2.

Instruments

The Elementary Reading Attitude Survey (ERAS) (McKenna & Kear, 1990) was developed to measure the attitudes of students towards reading in both recreational and academic form. The ERAS has 39 questions which are designed for group-administered.

The Gates-MacGinitie Reading Tests (MacGinitie & MacGinitie, 1989) are used extensively in the public school systems across the United States to measure reading achievement in the areas of vocabulary and comprehension. Test items have been reviewed and approved by consultants from minority groups.

Limitations of the Study

Generally, an experimental design type is superior to a pre-experimental design type because more control of internal and external validity is possible. As all Title I schools that volunteered for this study used the AR program exclusively for recreational reading, control sites were unavailable. Furthermore, as classes are intact units, randomization of subjects was prohibited. Therefore, an experimental design, with stronger internal validity was not possible for this study. The researcher was employed as a full-time speech pathologist at one of the Title I schools during the 1998 - 1999 school year, and access was possible.

Given the pressing needs of the urban learner, particularly in reading, the pre-experimental research approach was utilized to obtain practical information on the AR program's effect in the urban elementary school population. Threats to internal validity in the pre-experimental model are addressed in Chapters 3 and 5.

Secondly, information reported as reading practice which resulted in Accelerated Reader testing may be disingenuous. The amount of reading practice obtained by the student may exceed Accelerated Reader books tested upon, as other types of reading practice may have occurred.

Additionally, economic information regarding free-reduced breakfast/lunch status is privileged with regard to the individual student; only school-wide data is available. Selection bias may exist as some students who participated in this study may not receive free/reduced meals and therefore may be different in socio-economic status than their urban peers.

Policy Implications of the Study

The current study was designed as basic, exploratory research to evaluate the effect of the Accelerated Reader recreational program on urban elementary school children receiving Title I services due to income limitations. Today's educator should choose the best recreation reading program available for students, based upon research specific to the target population. When a population is limited to diverse learners from low SES backgrounds, current research data may not apply. The existing study provides data on reading achievement and attitude using the Accelerated Reader program for promotion of recreational reading in a low-income urban sample.

the Accelerated Reader program for promotion of recreational reading in a low-income urban sample.

Summary

The purpose of this study was to provide information towards closure of the "gap in knowledge" that exists in the urban, low-income student with regard to recreational reading practice with the Accelerated Reader program. This study evaluated reading achievement (i.e. vocabulary and comprehension) and reading attitude using the Accelerated Reader program in three grade levels in a low-income student sample. It explored the relationship between grade levels three, four, and five, as well as reading ability levels (below grade level; on/above grade level) while examining participation levels in the Accelerated Reader program by student point accumulation. Using a select sample, the study examined the effect various participation levels in the Accelerated Reader program had on students in grades three, four, and five with regard to reading vocabulary, comprehension, and attitude.

CHAPTER 2

REVIEW OF RELEVANT LITERATURE

This chapter reviews literature which focuses on early literacy experiences, and language and vocabulary development of the at-risk learner. An overview of reading comprehension, reading instructional programs, recreational reading, and the Accelerated Reader program are provided. Attitudes related to reading and reading success are included in the review of relevant literature.

Early Literacy Experiences

Concepts about print and reading are learned by many children prior to entering school (Mason & Allen, 1986; Ninio, 1980; Teale & Sulzby, 1986). Differences in the amount and quality of linguistic experiences of young American children from birth to three years of age affect vocabulary development (Hart & Risley, 1995). Specific elements of the home environment have been found to affect reading skill acquisition (Hess, Holloway, Price & Dickson, 1982). More than the amount of reading material in the home is required to foster early literacy in children (Durkin, 1966). Children who are routinely read to learn the language used in written narratives. Children that have been exposed to rich and varied experiences enjoy higher levels of reading achievement (Crain-Thoreson & Dale, 1992).

Hart and Risley (1995) provided empirical evidence that the early linguistic environments of young children have long-term effects on language development and school performance. By age three, trends in amount of talk, vocabulary growth, and style of interaction were well established. The importance of parent-talk and parent-child interactions was studied in families from welfare, working and professional classes. All parents provided quality interactions with their children which did not depend on parents' educational advantages. However, the children of the welfare class received fewer language opportunities and of lesser quality than working and professional class children. Fewer choices were given to these children, resulting in a more limited vocabulary growth than those of the working or professional class. Thus the child in the welfare class is projected to most likely have difficulty understanding content vocabulary of high school text books due to limited vocabulary.

High parental literacy modeling has been associated with children who tend to show a

higher interest level in learning to read (Morrow, 1983). Low-literacy (reading level of grade equivalent 7.9 or lower) and high-literacy (reading level of grade equivalent of 13.0 or higher) parents have different perceptions about what is important for early literary development. The variety of low-literacy caretakers' perceptions about how to help preschoolers and about why children don't do well in school was restricted when compared to high-literacy caretakers (Fitzgerald, 1989). Low-literacy parents lacked an understanding of the importance of adult role modeling and therefore may not know how to be role models. Their own inability to read well may inhibit them from attempting to be role models (Fitzgerald, 1984).

Emergent literacy in the home setting in transition years from pre-kindergarten through the early years of elementary schooling in a large city was studied using longitudinal methodology (Baker, Sonnenschein, Serpell, Fernandez-Fein & Scher, 1994). Diary-analysis of families in all socio-cultural groups revealed that all children were provided with frequent opportunities to engage in actions that were conducive to literacy development. Middle-income families promoted literacy as a form of entertainment. Lower-income families viewed literacy as a skill to be deliberately learned.

Parents serve as role models for early literacy development. Children watch their parents and see if newspapers, magazines, and books are an interesting and enjoyable part of their parents' daily routine. A child who has had the opportunity to observe first-hand the value of reading and writing is better prepared for literacy experiences in school (Ollila & Mayfield, 1992).

Language of the At-Risk Learner

Cultural dialect forms used by many African American children and adults differ

markedly from Standard English. The dialect differences are reflected in spoken and written language of children. However, Standard English is the mode used to communicate in nearly all written material used by students. A three-year study of the language performance of children from poverty was conducted by Fazio, Naremore and Connell(1996). Objective criteria identified children as specific language impaired from low-scoring normal children in the borderline area on the language continuum. Environmental stress due to the various effects of poverty may be detrimental to language development.

The persistence of non-standard dialect in 114 African-American and White children in grades three, five, and seven was examined by Isaacs (1996). The focus of three experimental tasks administered was to discern whether or not discrimination skills, comprehension, and production level of non-standard dialect (NSD) were related to the persistence of NSD. Results indicated that grade level in school accounted for the greatest variation in discrimination, semantic comprehension, and NSD production. This expected finding concurs with a normal maturation process that occurs as children get older. A second finding indicated that semantic comprehension varies markedly across grades. Certain linguistic competencies increase as students progress through the grades. Finally, there was no difference in NSD production among African Americans and White students in the central North Carolina subjects examined.

Vocabulary Development and the At-Risk Learner

Most of our formal education is acquired through language (Adams, 1990). Learning, as a language-based activity, is fundamentally and profoundly dependent on vocabulary knowledge. With inadequate vocabulary knowledge, some learners are being asked to develop novel combinations of known concepts with insufficient tools (Baker, 1995 b).

Hart and Risley (1995, p. 6) defined vocabulary as a stock of words (or signs) available to a person or a language community. The researchers observed subjects monthly and recorded their first words through age three. The amount of nouns and modifiers used per hour as well as the richness per utterance was most depressed in the welfare class parents when compared to the working and professional classes. In summary, what parents said and did with their children in the first three years of language learning had an enormous impact on how much language their children learned and used. There is a positive correlation between language accomplishments of the three year old and standardized language test performance in third grade (Hart & Risley, 1995).

Vocabulary limitations characterize the at-risk learner and have lasting effects (Baker, 1995a,b). The importance of vocabulary size and development is linked to academic achievement of disadvantaged students (Baumann & Kameenui, 1991). Vocabulary deficiencies were viewed as the primary cause of academic failure of the disadvantaged students in grades three through twelve.

Vocabulary growth appears to differ on the basis of Socio-economic status (SES) in the school populations examined. Students in schools with middle-SES had significantly larger vocabularies than those comparison school students in the low SES range (White, Graves, & Slater, 1990). Vocabulary problems of students who begin school with poor vocabularies worsen over time. In first grade, the vocabulary differences between students in the middle SES schools and students in the low SES schools were approximately 1,000 words. By third grade, vocabulary differences of approximately 5,000 words were found between students in these same groups (Baker, 1995a). Hart and Risley (1995) found similar vocabulary gaps with a younger

population.

What can educators do to improve the vocabulary of their students? Word meanings can be fully understood only when they are analyzed in the context of connected oral speech or written text; teaching word meanings in an abstract manner is futile (Baker, 1995a). Vocabulary instruction should teach word skills and strategies that will help students become independent word learners. Students must not only learn the meaning of words but have ample opportunity to use them (Smith, 1990). A successful vocabulary program may be defined as one in which a vocabulary increase exceeds what would occur during incidental learning opportunities. Practical vocabulary development programs are those that reduce the well-documented vocabulary gap between students with poor versus rich vocabularies (Stanovich, 1986; White, Graves & Slater, 1990).

The most profitable way to produce worthwhile vocabulary gains is to involve students in a program of recreational reading in the classroom (Nagy, 1975). After the third grade, the amount of vocabulary words learned is greatly determined by the amount of books read (Spiegel, 1981). Having students read recreationally will improve their reading fluency and develop vocabulary. Students who are not successful in developing early reading skills tend to become frustrated by reading activities, and therefore do not engage in the volume of reading necessary to significantly increase vocabulary development (Nagy, 1975).

Reading achievement and vocabulary acquisition are areas that converge in the research. According to Baker (1995a, 32-33) "The only realistic chance students with poor vocabularies have to catch up to their peers with rich vocabularies requires that they engage in extraordinary amounts of independent reading". Students learn word meanings in the course of reading

connected text, but the process appears to be time-consuming (Baumann & Kameenui, 1991). Students have to engage in considerable amounts of reading to be exposed to unknown words a sufficient number of times for them to be learned. An effective recreational reading program can provide students with an opportunity to improve reading fluency as well as vocabulary (Baumann & Kameenui, 1991).

Reading Comprehension

Reading comprehension is an ongoing thinking process that is composed of multiple interrelated factors: prior knowledge and background experiences, interpersonal and cultural experiences, cognitive and linguistic experiences and abilities, and an interest in and a purpose for reading (Fielding & Pearson, 1994). Reading comprehension requires an integration of motivational, metacognitve, and cognitive factors (Ehrlich, Kurtz-Costes, & Loridant, 1993).

Good readers generally have been read to from earliest childhood. They have a sense of story structure, and find listening to stories both informative and enjoyable. Ethnographic studies have shown that joint storybook reading is more common among middle-class families than among working-class families (Anderson & Stokes, 1984; Heath, 1983; Teale & Sulzby, 1986). Good readers often reread their favorite books and in doing so become fluent readers. Behaviors common to good readers are those of interest, purpose, and choice (Giddings, 1991). Vocabulary itself is developed throughout the reading process. Children can add to their vocabularies by listening and reading (Brooks, Hamann, & Vetter, 1997). The level at which a student is being challenged by exposure to new vocabulary and concepts without being frustrated is the zone of proximal development (Dixondrauss, 1995). The zone of proximal development is the reading level at which reading practice will promote maximum development

(Paul, 1996).

Bryant, Bradley, MacLean, and Crossland (1989) found a strong positive relationship between knowledge of nursery rhymes at three years of age and success in reading and spelling over the next three years. In addition, prior knowledge is critical to reading comprehension (Anderson, 1978): "There is a strong reciprocal relationship between prior knowledge and reading comprehension ability. The more one already knows, the more one comprehends, and the more one comprehends, the more one learns new knowledge to enable comprehension of an even greater and broader array of topics" (Fielding & Pearson, 1994, p. 62). Several effective strategies for activating prior knowledge are brainstorming, topic talking, semantic mapping, pre-reading questioning, and predicting (Hyerle, 1996).

Strategies that might be effective for one type of reader may be inappropriate for another. Instructional strategies should draw from the students' strengths and build on their weaknesses (Wade, 1990). Metacognition or strategies that teach children how to examine their own cognitive processes enhance a child's ability to read well independently. Metacognition is defined as thinking about one's own thought processes (Shepley, 1996). A series of strategies dealing with the reading process may take place as pre-reading, during reading, and/or post-reading activities (Shepley, 1996).

Inexpensive intervention strategies can be effective. Predictable stories were given to children in low-income families over a two-year period (McCormick & Mason, 1986). The experimental group was mailed stories to read at home. The control group received pictures of familiar children's stories and workbook activities. Both groups received lessons in school to learn about the material. Spelling and reading subtests were administered to all children at the

end of the Headstart year as well as the kindergarten year. The experimental group scored significantly higher on reading and spelling tests. Parents of the experimental group rated their children significantly higher on questions concerning their children's interest in and knowledge about reading and writing than did the parents of the control group.

The amount of time that students actually read daily must be increased and exceed the amount of time spent on skill development (Fieldin & Pearson, 1994). A wide variety of literature must be available. Engaging in sustained reading of connected and meaningful text appears to be as effective as spending time on the learning and practicing of comprehension skills (Reutzel, D., & Hollingsworth, P., 1991).

Types of Reading Instruction Programs

Research in reading prior to the 1980's was mainly directed toward word recognition and skill acquisition. The whole language philosophy altered the focus from skill development and precise text meaning to comprehending passages and understanding words in context while relating students' personal experiences to reading. Reading should develop naturally and functionally (Giddings, 1991) and involve the language processes of listening and speaking (Gonzalez, 1994). Literature-based reading instruction using the whole language approach teaches children to read in context using a wide variety of materials such as songs, poems and stories. Good instruction builds on the language, knowledge and strategies children have been developing since birth (Yatvin, 1991). The use of children's literature in the teaching of reading has a positive effect on students' achievement and attitudes toward reading (Giddings, 1991). Flexible grouping for instruction is used in the whole language approach (Dewalt, Rhyne-Winkler, & Rubel, 1993). Students not only learn to read, but they also develop a love for reading and become life-long

readers through the process of using a literature-based method (Rosenheck, 1996).

Built on interactive theory, the whole language approach embraces the notion of "emergent literacy," introduced by Marie Clay in 1966 (Morrow, 1989). Beginning in infancy, children gradually acquire the skills they will need to become literate. Emergent literacy theorists who adhere to the whole language philosophy view the acquisition of reading as an integral part of learning about the language skills of listening and writing (Morrow, 1989).

Basal readers are a widely used resource in which isolated aspects of language such as letter-sound correspondence are taught in sequential lessons. Basal readers sometimes create artificial language passages (Goodman, 1986). Homogenous grouping of students is a common aspect of the basal program. The absence of independent reading is another concern frequently cited with basal reading programs (Dewalt, Rhyne-Winkler, & Rubel, 1993).

There is controversy among educators about the most efficient method for reading instruction. The basal approach has an emphasis on decoding whereas an alternate method, the whole language approach, integrates all language components into the teaching of reading (Bracey, 1992; Holland & Hall, 1989). Comparison studies of reading achievement utilizing the basal versus the whole language approach of elementary school populations showed there were no significant differences between reading achievement scores of students taught under a basal approach and those who learned using a whole language approach (Dewalt, Rhyne-Winkeller, & Rubel, 1993; Holland & Hall, 1989). Bracey (1992) recommends that the teaching of reading be a balanced approach that integrates both the phonics and whole language instructional methods.

Recreational Reading

A diverse, literate culture requires diverse readers. One of the major concerns expressed in the report, *Becoming a Nation of Readers* (Anderson, Hiebert, Scott, & Wilkerson, 1985), focused on the truncated time spent reading connected texts during the typical instructional period. This study recommended that the amount of time students are encouraged to read connecting texts both in and out of school be increased.

Reading requires practice in order to achieve fluency. Practice should be simple enough to allow a child to experience success and enjoyment so that he or she will read more by choice. Supplemental reading programs are generally inexpensive and allow students an opportunity to practice reading skills at their own paces. Recreational reading is non-competitive and many skills can be developed without the assistance of a teacher. If automatic reading is a desired goal of a reading program, three and a half hours to four hours of reading per week are necessary to achieve fluency. The amount of time a youngster spends in recreational reading or total reading is what will determine automaticity (Safran, 1986).

The effect of a recreational reading program on standardized test scores was examined by Erazmus (1987). Fifth grade subjects were placed in high, middle or low reading groups according to teacher assessment. Treatment consisted of student participation or non-participation in the Pizza Hut "Book It" Program to encourage student reading. No statistical difference between the experimental and control groups in improvement of reading ability for the high and middle reading groups occurred. However, in the low reading group, significant differences in reading ability between the control and experimental groups were found, suggesting that students who participated in the recreational reading program had more improvement in reading ability

than those who did not participate. The theory of reading practice predicts that students with higher reading ability will need to read more to get the same amount of improvement as a lower reading ability student (Paul, 1996).

Conner (1954) examined data of students with good, medium and poor reading habits. When intelligence was held constant, a significant positive relationship between reading habit and reading achievement occurred. Reading is a skill that must be practiced for mastery.

The Accelerated Reader Program

Instead of focusing resources on remedial programs which have been initiated well after a reading problem has been documented, professionals could examine other options (Shapiro, 1990) such as recreational reading. The reading of books was found to be positively correlated to reading achievement (Giddings, 1991).

The use of the computer in the urban population as a teaching tool has been found valuable when used in the appropriate context (Kinsman, 1993). Technology allows children to experience success in learning (Ruder, Buchsbaum, Hill, & Orlando, 1992) and helps students reach their potential (Blevins, 1993). Instruction which involves computers benefits students because of their enthusiasm and because academic motivation usually improves (Rosenheck, 1996).

The purpose of the Accelerated Reader program is to offer students appropriate recreational reading as a means of encouraging reading achievement gains. The Accelerated Reader program is highly structured and often tied to creative incentives initiated at the school level such as awards ceremonies, certificates of achievement, ribbons, picture-taking and pizza parties.

The Accelerated Reader (AR) program is based on a three-step process. A student chooses to read a book from the Accelerated Reader book list, which contains more than 12,000 titles. In order to develop as independent, motivated readers, students must have the opportunity to self-select materials that are within their ability levels (Fielding & Pearson, 1994). However, educators and parents must supervise the child's choice of books to insure developmental appropriateness. In the AR program, a book has a point value based on the grade level and readability formula. Prior to 1994, Advantage Learning Systems used the Fry Readability Index (Fry, 1968). Since January 1994, Advantage Learning Systems has used an automated program which utilizes the Flesch-Kincaid reading index to determine readability (Flesch, 1974). Each book is assigned a maximum "AR Point Value," derived from its length and reading level according to the following formula:

$$\text{AR Points} = (10 + \text{Reading Level}) \times \frac{(\text{Words in Book})}{100{,}000}$$

The student reads the selected book at his/her own pace and then takes a test on the computer. The test consists of multiple choice questions about important facts in the book. Many of the quizzes on the classic books are made up of twenty questions; short books written at first- or second- grade level generally have five questions; most other quizzes have ten questions. Although some questions measure inferential thinking skills, most evaluate literal comprehension.

An effort was made to alleviate bias in question content. If the quizzes required higher-order thinking skills, students who possess well-developed skills would score higher than students who are not so advantaged. Because the AR quizzes contain questions of literal comprehension, all students who read the books with understanding receive the same score.

Students must receive at least 60 percent on the test to earn any points. This makes it extremely unlikely that a student can earn points without reading the book with some comprehension. Careful test writing and security features in the software greatly reduce the possibility of student cheating. AR points are a fairly accurate measure of the quantity of words being read and comprehended.

On the average, Advantage Learning Systems (1997) estimates that students need to read thirty minutes to one hour per day for an entire school year to earn 100 points. Students may only test once for a given book. If students read too quickly, they score poorly because they are not reading with comprehension. When implemented according to design, teachers oversee students' reading patterns, and if their test scores are too low, intervene with advice on reading level and rates (Paul, VanderZee, Rue & Swanson, 1996). The computer scores the test, calculates the number of points earned by the student, and records the data. Reports are generated listing AR points earned, number of tests taken, number passed, average grade level of books read and average percentage achieved on the tests. Therefore, an accurate measure of reading practice is obtained from review of AR data.

The Institute of Academic Excellence study, *Impact of the Accelerated Reader on Overall Academic Achievement and School Attendance* (Paul, Swanson, Zhang, & Hehenberger, 1996) examined reading data from more than 6,000 Texas schools. Students in schools that used the Accelerated Reader program performed significantly better on both standardized and performance-based assessments designed to measure critical thinking. Improvements in reading, writing, math, and social studies were documented. The researchers inferred that the thinking skills developed by the literature-based Accelerated Reader program

are readily transferable to other academic tasks. A second study, *Learning Information System Effects on Reading, Language Arts, Math, Science, and Social Studies* (Paul, Swanson, Zhang, & Hehenberger, 1997) again found a positive relationship between the use of the Accelerated Reader program and measures of critical thinking.

The Institute of Academic Excellence studied patterns of reading practice (Paul, 1996) in 659,214 students in grades K-12. The Accelerated Reader program measured students' literature-based reading practice in small and large public and private schools. The ethnic mix and socioeconomic factors of students in these schools roughly approximated that of United States. Trends across grade levels and amounts of practice between high and low performing students based on standardized test scores were compared. The amount of reading practice was positively correlated to reading performance of individual students.

McKnight (1992) had individual students read to younger children as well as take Accelerated Reader Tests. Accelerated Reader worked well with the hard-to-motivate youngsters. Attitudes toward reading improved, and a group of unmotivated and uninterested fifth-grade readers increased recreational reading using the Accelerated Reader program.

A five-year longitudinal study was conducted at two middle schools in North Carolina. An Accelerated Reader school and control school tracked 25 students at each site. The school that used Accelerated Reader (AR) improved their mean score by 13.2 percentage points per year using total Children's Assistance Trust reading scores whereas the non-AR counterpart's mean scores improved 5.5 percentage points per year using the same measure (Peak, J. & Dewalt, M., 1993).

In contrast to some research findings, several studies show that better libraries lead to

more reading and higher test scores (Krashen, 1993; Lance, Welborn, & Hamilton-Pennell, 1993). McQuillan (1996) suggested that devoting money to purchase books rather than rewards might prove more beneficial in promoting reading among children.

Attitudes Related to Reading

McKenna and Kear (1990) produced a public-domain instrument that enables teachers to estimate attitude level efficiently and reliably. The Elementary Reading Attitude Survey (ERAS) can be given to an entire class in a matter of minutes. Recreational, academic and total reading scores are converted to percentile ranks. The "total reading" score was used as an index of reading attitude in this study.

Attitude plays a role in students' development as readers. Urban second graders were individually assessed informally on primer or preprimer passages using an informal reading inventory and were administered a standardized reading test and a reading attitude measure. Results indicated that attitudes toward reading were positive. There was a nonsignificant correlation between reading attitude and reading achievement (Linek, Sturtevant, Rasinski, & Padak, 1990).

A strategy to improve elementary students' attitudes and participation in recreational reading was designed by Duran (1994). Parents of students involved in the treatment were surveyed about their recreational reading habits as well as those of their children. Reading for fun was not a preferred leisure-time activity for the group of students from predominately low-income, single family homes with low national reading percentile scores. An at-school mentoring and modeling project called "Reading Buddies" was implemented for fourteen weeks using

children's literature including read-along audio tapes and videos. Results indicated that the practicum was successful in raising the interest of the target students to read for fun and pleasure. Parents observed behavioral changes in their children's attitude toward reading, and ERAS scores and numbers of books read increased.

Summary

Limited research on the at-risk, diverse urban learner regarding recreational reading choices reflect the lack of attention that has been paid to this population. The need for a viable recreational reading program to promote reading achievement for the urban learner is clear. With reading being central to learning in school, the AR recreational reading program shows great promise of improving students' reading achievement through reading practice.

This study is an attempt to understand the recreational reading habits of a select group of urban learners. It is possible that the needs of the urban, diverse learners differ from those of the advantaged learner.

CHAPTER 3

METHODOLOGY

Purpose

Interest in urban education led the researcher to question the at-risk urban learners' performance in the Accelerated Reader program and its relationship to reading achievement and reading attitude. The current study was designed to investigate the effectiveness of the Accelerated Reader program in improving reading vocabulary, reading comprehension, and reading attitude in an urban elementary school district. This chapter provides detailed descriptions of the population studied, instruments used, data collection process, and data analysis.

Research Question and Hypothesis

Problem Statement

How does use of the Accelerated Reader program in the 1998 - 1999 school year affect reading vocabulary, comprehension, and attitude of third through fifth grade urban learners?

This study measured reading vocabulary and comprehension gain scores on the Gates-MacGinitie Tests (MacGinitie & MacGinitie, 1989) as well as reading attitude using the Elementary Reading Attitude Survey (ERAS) (McKenna & Kear, 1990) using pre-testing and post-testing. Accelerated Reader participation of urban third, fourth, and fifth graders was monitored from September 1998 through June 1999.

Hypothesis

Hypotheses 1. When socioeconomic status is held constant, there is no difference in mean scores on the Gates-MacGinitie Tests (MacGinitie & MacGinitie, 1989) reading vocabulary and comprehension tests of third, fourth, and fifth grade urban learners from September 1998 through June 1999 on Type of AR Usage as follows: (A) low usage: 0 - 20 points AR points (B) average usage: 21 - 74 AR points; (C) high usage: 75 and above AR points.

Hypotheses 2. When socioeconomic status is held constant, there is no difference in mean scores on the ERAS reading attitude tests of third, fourth, and fifth grade urban learners using the Accelerated Reader program from September 1998 through June 1999 on Type of AR Usage as follows: (A) low usage: 0 - 20 points AR points (B) average usage: 21 - 74 AR points; (C) high usage: 75 and above AR points.

Research Design

General Description

This study used a one group pre-test and post-test design. Firm conclusions of causal ty can only be made in experimental design types and are not possible in this study. Title I school administrators volunteered for participation in the study. Seven schools completed all requirements for inclusion in this study. Data were collected from elementary school students in grades three, four and five receiving Title I services due to low-income parental status.

Independent Variables

The selection of independent variables for this study was based on research identifying conditions and factors shown to be related to student recreational reading.

Two independent variables (IV) were as follows:

IV (A) Levels of Participation in the AR program as noted on AR computer reports:

(a) Zero (0) to 20 points - low AR participation
(b) 21 to 74 points - average AR participation
(c) 75 points and above points - high AR participation

IV (B) Grade Level:

(a) Third
(b) Fourth
(c) Fifth

Students were classified according to the independent variable, Grade Level. The descriptive statistic Type of Reader: "below grade level" or "on/above" grade level served as a modifier to the independent variable grade level. The following definitions apply:

Below Grade Level: A vocabulary and comprehension score on the Gates-MacGinitie Test of Reading (MacGinitie & MacGinitie, 1989) Form L in pre-testing and post-testing as follows:

In third grade less than or equal to 2.9
In fourth grade less than or equal to 3.9
In fifth grade less than or equal to 4.9

On/Above Grade Level: A vocabulary and comprehension score on the Gates-MacGinitie Test of Reading (MacGinitie & MacGinitie, 1989) Form L in pre-testing and post-testing as follows:

In third grade greater than or equal to 3.0
In fourth grade greater than or equal to 4.0
In fifth grade greater than or equal to 5.0

The dependent variables (DV) that were measured in the study utilizing pre-and post-testing (September 1998 through June 1999 administration) were as follows:

DV (A) Gates-MacGinitie (MacGinitie & MacGinitie, 1989) Vocabulary test score

DV (B) Gates-MacGinitie (MacGinitie & MacGinitie, 1989) Comprehension Test score

DV (C) Elementary Reading Attitude Scale (ERAS) (McKenna & Kear, 1990) test score

Internal Validity Concerns

Unaccounted factors in research can compromise the value of the experiment. Stanley and Campbell (1966) in their seminal work described internal validity as "the basic minimum without which any experiment is uninterpretable" (p.5). According to Stanley and Campbell's definitions, the following five factors threaten this study's internal validity:

History includes the specific events occurring between the first and second measurement in addition to the experimental variable (Stanley & Campbell, 1966, p. 5).

Maturation is the process within the respondents operating as a function of the passage of time per se (Stanley & Campbell, 1966, p. 5).

Testing concerns the effects of taking a test upon the scores of a second testing (Stanley & Campbell, 1966, p. 5).

Experimental Mortality is the differential loss of respondents from the comparison groups (Stanley & Campbell, 1966, p. 5).

Statistical Regression operates where groups have been selected on the basis of their extreme scores (Stanley & Campbell, 1966, p. 5). Those that scored exceptionally high (or low) on the first measurement, score closer to the mean on the second measurement as there is a regression to the mean (Kachigan, S., 1986, p. 270).

Control of factors as well as accountability for factor consequences is important in assessing an experiment's internal validity. In this study, SES was controlled via free/reduced meal status on a school-wide basis. Due to the fact that such information is privileged, individual student status remained confidential. Therefore, as a cohort group socioeconomic status was low. The fact that the group shared a low socio-economic status infers that educational opportunities within the group are probably similar.

History is wide-sweeping in scope. Factors that affect history in this study include, but are not limited to teacher proficiency, school size, class size, AR reinforcements at the class and school level, and so forth. Caution in interpretation of this study's results is necessary.

Maturation was controlled by test administration scheduling within a two-week period of time among schools for both pre-testing and post-testing. Students registered in this school district adhere to the same age restrictions; however some students were retained in school for one or more years. The retainers were not distinguished from the other subjects but were classified as functioning at either third, fourth or fifth grade levels. Normative information was provided for grade levels only, and not ages. Therefore results viewed are appropriate for grade levels and not necessarily chronological age.

Testing consisted of using the Gates-MacGinitie Form L Reading Tests (MacGinitie and MacGinitie, 1989) as well as the Elementary Reading Attitude Scales (McKenna & Kear, 1990) for both pre-testing and post-testing. Due to the lengthy interim period between testing of nine or ten months, the same form of the tests were used. It is reasonable to assume that a student would not recall information from pre-test to post-test administration to make testing a significant research concern.

Experimental mortality was a factor to consider as the student population is transient. To counter such events, a large sample size was used for testing; when students were matched on pre-test and post-test observations, a reasonable sample size remained for analysis.

Statistical regression was a factor to consider as the student population had a predominance of below-average grade readers. These scores can be interpreted as "extreme". By using descriptive statistics, i.e. below average grade reader and on/above average grade reader some control was placed on these groups.

Statistical regression also was noted as a threat in analysis of the attitude data due to the students who scored at or above the 90th percentile during pretesting. Those students presented a "ceiling effect" at pre-testing. Caution in interpretation of ERAS data was necessary.

External Validity

External validity refers to the representativeness or generalizability of research results. The experimental results of this research can be generalized with confidence to similar low SES urban populations of elementary school children using the Accelerated Reader with

norm-referenced, standardized vocabulary, comprehension, and attitude instruments.

Instrumentation

Because the Elementary Reading Attitude Survey (ERAS) (McKenna & Kear, 1990) is in the public domain, the instrument is inexpensive to administer to large groups. The ERAS has 39 questions which are designed for group-administration. Students were familiarized with the moods of four pictures of the Jim Davis comic strip character Garfield. The expressions from left to right on the page progress from very happy, to a little happy, to a little upset and finally to unhappy. The students were instructed to circle the character mood that represents how they felt in response to a reading-related statement, read twice.

A Total Reading score was obtained by combining the scores from the Academic Reading index with those obtained in Recreational Reading. Raw scores were converted to percentile scores using either grade level or age as criteria. For purposes of this study, the Total Reading score was used according to grade level standards.

Each of the Gates-MacGinitie Reading Tests (MacGinitie & MacGinitie, 1989) test Levels 3 through 5/6 consisted of a Vocabulary Test and a Comprehension Test. The Vocabulary Test, given first, measured the student's reading vocabulary. This test contained 45 questions, each consisting of a test word in a brief context followed by five other words or phrases. The student chose the one word or phrase that means most nearly the same as the stimulus word. Difficulty progressed from reading easy and commonly used words to less common and more difficult words. The purpose of the Vocabulary Test was to measure word knowledge, rather than the ability to derive meaning from a context.

The Comprehension Test measured the student's ability to read and understand

passages of prose and simple verse. This test contained 14 passages of various lengths, with a total of 48 questions about these passages. Some questions provided explicit information to the reader whereas others required the reader to construct and understand implicit information in the passage.

Passages were chosen so that females and males of various ethnic groups would be represented. Authors of the passages included women and men of varying ethnic backgrounds. In addition, test items had been approved by consultants from minority groups (MacGinitie & MacGinitie, 1989).

Reliability and Validity

A test's reliability is a measure of the likelihood that students who have taken it would achieve the same scores if they were to take it again (Gates-MacGinitie, 1989). A test's reliability refers to the extent that it measures the knowledge and skills to which it proports.

Internal consistency coefficients of The Elementary Reading Attitude Survey (McKenna & Kear, 1990) were reported as falling within the .74 to .89 range. Research on the construct validity of the academic and recreational subscales indicated that these subscales are measuring separate, but related constructs. The results of factor analyses provided evidence for a two-factor solution. Raw scores were converted to percentile rankings. (McKenna & Kear, 1990).

During the development of the Third Edition of the Gates-MacGinitie Reading Tests, a number of steps were taken to assure that the tests would be valid for most reading programs (Gates-MacGinitie, 1989). A nationwide field test was administered to select final items.

Vocabulary test words were selected from two vocabulary lists and were judged to be

of general usefulness. A part-of-speech count was made and was represented by the vocabulary test of words.

For Levels 3-10/12 of the comprehension tests, passages were selected from published sources that represent materials students are likely to read for assigned recreational reading. Each test was represented by a mixture of poetry and of natural science, social science, and art passages. Readability of the passages was assessed with three readability formulas (Gates-MacGinitie, 1989).

Two experienced reading supervisors read each passage, and on the basis of maturity and content, judged the grade levels for which the passage would be appropriate. A proportion of literal and inferential questions appropriate to the grade level was included in each test (Gates-MacGinitie, 1989).

Data Collection Procedures

Setting for the Study

This urban public school system educating 36,000 students is one of the largest in the state of Virginia. Diverse ethnic and socio-economic groups form the student population which are housed in 35 elementary schools, eight middle schools, five senior high schools, and 12 auxiliary facilities.

Population

The population being studied included students enrolled in third, fourth, and fifth grades in ten Title I schools in a Southeastern urban school system. The ten Title I schools were assured complete confidentiality. Three schools were eliminated due to non-participation in post-testing and/or non-compliance with AR roster tracking data. Seven

schools yielded data for analysis in this study.

Access

The setting chosen for this study contained a target population of urban elementary students of low SES. SES was representative of a low-income demographics because 80% or more of all students qualified for free/reduced meal prices as determined by Federal guidelines.

Procedures

After receiving approval from the Old Dominion University Human Subjects Committee and school system Director of Research, principals of the target schools were contacted. Ten principals volunteered to participate in the study.

Prior to pre-testing in September and October, teachers were presented with an inservice by the researcher. The purpose of the study was explained, and materials for testing discussed and distributed. The classroom teachers administered all test materials directly. The researcher collected all materials after testing for scoring.

Post-testing dates in late May/early June were scheduled with building principals. Materials were provided for classroom teachers in advance of the testing date and collected for scoring by the researcher upon test administration.

Data Collection

Pre-testing was conducted in September and October 1998 on 1,611 students in grades three, four and five; post-testing was conducted in May and June 1999 on 1,594 students. Scoring of all tests was done by hand by the examiner and a trained assistant with random accuracy checks conducted.

Collection of an individual AR point roster for each student as well as pre-test and post-test vocabulary and comprehension tests was completed for 755 students. In addition 515 of these students completed the Elementary Reading Attitude Scales (ERAS) attitude testing as well.

A significant decrease in data from students tested to matched pre-test/post-test sets occurred. Attrition or absence from pre-test administration to post-test administration accounted for substantial data loss. Additionally, many answer sheets, particularly the ERAS protocols, were not identified by student name and therefore were excluded. Several schools did not keep AR computerized rosters or did not return study information to the researcher.

Data Analysis

After scoring, data were coded and entered into a data file for analysis using SAS (Appendix B). Hypothesis 1 was examined using Multivariate Analysis of Variance (MANOVA). The Wilks'-Lambda test was used to examine the dependent variables reading vocabulary and comprehension in 755 observations. This test is appropriate for the multivariate case where several means and variances for each group exist (Kachigan, 1986. p. 329).

Category data, in the form of frequency counts were computed. Such information described the relationship between independent variables AR Usage and Grade Level resulting in a 3 X 3 Table of Means.

An Analysis of Variance (ANOVA) was used to examine the dependent variable mean of the Elementary Reading Attitude Survey (ERAS) (McKenna & Kear, 1990) using 515

observations. Analysis were done separately instead of in a combined MANOVA format to avoid loss of 240 observations. Additionally, by examining the dependent variables separately more detailed information was obtained than with a combined overall single MANOVA.

CHAPTER 4

RESULTS

The data collected for this study are reported and analyzed in this chapter. The data analysis was organized around the two hypothesis which were formulated to address research questions. Included in this chapter are the following topics: (a) descriptive data, (b) statistical data analysis, (c) summary. The appendix contains reference materials divided into three sections: data, program commands for SAS, and output.

Appendix A contains all data observations. Grade Three comprised 21.99 % of the student sample (166 students of a 755 student sample) and was the smallest grade level represented. This was due to the fact that School 1 lost approximately one hundred completed third grade pre-test student protocols. The fourth and fifth grade percentages were approximately equal at 39% and 37 % (n = 297 and 292).

Statistical Analysis of Hypotheses

The 755 observations containing vocabulary and comprehension data were used in Multivariate Analysis of Variance (MANOVA) to test Hypothesis One:

When socioeconomic status is held constant, there is no difference in mean scores in vocabulary or comprehension as measured by the Gates-MacGinitie Reading Test (MacGinitie & MacGinitie, 1989) in September/October 1998 and May/June 1999 when Accelerated Reader treatment is administered to urban learners in grades three, four, and five.

The 515 observations containing ERAS (attitude) data were used in an Analysis of Variance (ANOVA) format to test Hypothesis Two:

When socioeconomic status is held constant, there is no difference in the mean scores on the Elementary Reading Attitude Scale (ERAS) (McKenna & Kear, 1990) of third, fourth, and fifth grade students using the Accelerated Reader program for recreational reading from September 1998 through June 1999.

Descriptive Statistical Analysis

Students are classified according to the independent variable, Grade Level. The descriptive statistic Type of Reader: "below grade level"and "on/above" grade level served as a modifier to the independent variable grade level.

Table 1
The percentage of Type of Reader by Grade Level
in pre-test and post-test vocabulary and comprehension assessments

Type of Reader	Vocabulary Percentage		Comprehension Percentage	
	Pre-Test	Post-Test	Pre-Test	Post-Test
Grade 3 below grade level	80.72	36.14	82.53	42.77
Grade 4 below grade level	75.76	51.52	80.81	48.15
Grade 5 below grade level	77.05	68.15	77.40	58.56
Grade 3 on/above grade lev.	19.28	63.86	17.47	57.23
Grade 4 on/above grade lev.	24.24	48.48	19.19	51.85
Grade 5 on/above grade lev.	22.95	31.85	22.60	41.44

Note. n = 755

At pre-testing in September and October 1998 at least 75% of all students tested below grade level in reading vocabulary and comprehension. At post-testing, after the AR treatment had been administered for the duration of the school year, the percentage of students testing below grade level in these areas decreased in all grade levels.

Table 2 contrasts the descriptive statistic, Type of Reader, with Grade Level.

The pre-test and post-test variables were subjected to Multivariate Analysis of Variance (MANOVA) analysis to determine if the differences were statistically significant. Significant differences between pre-test and post-test assessments of vocabulary and reading comprehension were noted for Type of Reader. The following null hypothesis were rejected:

No overall difference exists between below versus average, above effect;
No overall difference exists between below versus average effect;
No overall difference exists between below versus above effect;
No overall difference exists between average versus above effect;
No overall difference exists between Grade 3 versus Grade 5;
No overall difference exists between Grade 4 versus Grade 5.

Table 2

Test Contrasts for Type of Reader and Grade Level

Test Contrast	Wilks' Lambda	F value	p-value
Type 1 vs. Type 2,3	0.9464	21.7766	0.0001*
Type 1 vs. Type 2	0.9838	6.1332	0.0023*
Type 1 vs. Type 3	0.9459	21.3141	0.0001*
Type 2 vs. Type 3	0.9788	8.0797	0.0003*
Grade 3 vs. Grade 4	0.9999	0.0394	0.9614
Grade 3 vs. Grade 5	0.9865	5.0791	0.0064*
Grade 4 vs. Grade 5	0.9859	5.3393	0.0050*

Note: Type 1: Below Grade Level; Type 2: On Grade Level; Type 3: Above Grade Level
(*) indicates a p-value that is significant at the 0.05 alpha level of significance
n = 755

A cross-tabulation of the two categories Type of AR Usage and Grade Level with the descriptive modifier Type of Reader is reported in Table 3. Although the "Low AR Usage" category afforded the reader with little reading practice, the greatest number of students obtained this status during the ten month study. The "High AR Reading" status was obtained by the smallest number of students. In fact, according to Advantage Learning Systems (1997), the Accelerated Reader program user, in most grade levels, will need to earn 100 AR points by reading thirty minutes to one hour per day for an entire school year. Accordingly, the data from this study indicate few students read for one half to one hour

daily. In later analysis, Type of Reader will be used to provide additional information about this cohort group.

Table 3

"Type of AR Usage" and" Grade Level" Numbers/ Percentages

	Type of Accelerated Usage			
Grade Level	Low AR Usage	Average AR Usage	High AR Usage	Total Number (Percentage)
Grade 3	69	71	26	166 (21.99%)
Grade 4	156	111	32	297 (39.34%)
Grade 5	168	93	31	292 (36.68%)
Total	391 (51.8%)	275 (36.4%)	89 (11.8%)	755 (100%)

As reading practice increased with AR usage, comprehension scores improved. The "low AR usage" group obtained an average growth in comprehension of 0.73 years. The "average AR usage" group obtained a mean growth in comprehension of 1.52 years, whereas the "high AR usage" group had an average growth in comprehension of 2.24 years. By maturation alone with exposure to the reading curriculum a one year growth in comprehension is predicted. The "low AR usage" group did not meet this expectation, and practiced reading minimally, as indicated by AR points earned. The "average" usage group gained a half-year in comprehension over the expected year's growth. The "high AR usage group" exceeded normal expectations by an additional one year and two months comprehension growth.

Type of AR Usage and Type of Reader were examined by vocabulary and comprehension in May/June 1999 in Table 4. When descriptive statistics, Type of Reader

were analyzed with Type of AR Usage for post-vocabulary and post-comprehension scores, similar patterns were noted. "Low AR Usage" students composed 33 % and 18% of "below" and "on/above" grade level readers respectively.

Table 4

Frequency and Percentage: Type of AR Usage x Type of Reader for post-vocabulary and post comprehension

Type of Reader

AR Usage	Type of Reader	Dependent Variable Post Vocabulary	Dependent Variable Post Comprehension
Low	below grade level	N = 254 (33.64%)	N = 252 (33.38%)
Low	on/above grade level	N = 137 (18.15%)	N = 139 (18.41%)
Average	below grade level	N = 136 (18.01%)	N = 117 (15.50%)
Average	on/above grade level	N = 139 (18.41%)	N= 158 (20.93%)
High	below grade level	N = 22 (2.91%)	N = 16 (2.12%)
High	on/above grade level	N = 67 (8.87%)	N = 73 (9.67%)

n = 755

For post-vocabulary measurements in the "average AR Usage" category the Type of Reader, "below" and "on/above" grade level, were equal at 18% each. Post-comprehension scores for the "average AR Usage" category indicated that there were more "on/above" grade level readers than "below" grade level readers earning 21 - 74 AR points. Patterns for "high AR usage" for post-vocabulary and post-comprehension were similar for the "below" and "on/above" grade level reader at approximately two percent and nine percent of each Type of Reader, respectively.

In order to statistically examine the relationship between Type of AR Usage and

Grade Level, mean differences were computed for vocabulary and comprehension in Table 5. Appendix L contains mean data for the AR usage. Trends reveal that as AR usage increases from "low" to "average" to "high" usage, mean difference in vocabulary and comprehension increased. In the "low AR usage group" and "average AR usage" group the mean vocabulary and comprehension scores decreases across grade levels three through five. However, in the "high AR usage" group, as grade level increases from three to five, the mean difference in vocabulary and comprehension also increases.

Table 5

Mean difference in Vocabulary and Comprehension by Grade x Type of AR Usage

Type of AR Usage	Grade 3 Voc.	Grade 3 Comp.	Grade 4 Voc.	Grade 4 Comp.	Grade 5 Voc.	Grade 5 Comp.
Low	.90	1.13	0.73	0.91	0.31	0.69
Average	1.02	1.55	0.91	1.50	0.48	1.08
High	0.98	1.78	1.21	2.14	1.08	2.58

Table 6

Examination of Effects: Type of AR Usage and Grade Level

Effect	Wilks' Lambda	F	p-value
Type of AR Usage	0.9428	11.13	0.0001*
Grade Level	0.9812	3.55	0.0069*
Type of AR Usage x Grade Level	0.9868	1.24	0.2698

Note. (*) indicates that a response is significant at the 0.05 alpha level of significance

In Table 6, it was noted that the interaction was not significant as the p-value of 0.2698 was greater than the alpha value of 0.05. For that reason, the null hypothesis: *no interaction effects* was accepted.

Testing for Type of AR Usage and Grade Level effects revealed a p-value of 0.0001 for Type effects. Therefore, the null hypothesis *no type effects* was rejected. When testing for Grade Level effects the p-value of 0.0069 was less than the alpha level of 0.05 and the null hypothesis, *no grade effects,* was rejected. In summary, Type of AR Usage and Grade Level were significant main effects.

Analysis of ERAS (attitude) data

The relationship between Type of Reader and Grade Level is depicted in Table 7 by computing the mean difference in ERAS (McKenna & Kear, 1990) scores. General linear model procedures for ANOVA results appear in Appendix K.

A negative sign indicates that scores regressed at post-testing when compared to pre-testing data. As discussed previously, this may be due to statistical regression.

Table 7

The mean difference in ERAS by Grade x Type of Reader

Type of AR Usage	Grade 3	Grade 4	Grade 5
Type 1: Low	-13.12	0.22	-4.54
Type 2: Average	- 3.65	3.72	1.73
Type 3: High	-2.4	-1.13	18.5

The effects "Type of AR Usage" and "Grade Level" are examined in Table 8.

Table 8

The effects "Type of AR Usage" and "Grade Level" on ERAS scores

Effect	F	p-value
Type of AR Usage	3.57	0.0289*
Grade Level	2.94	0.0536
Type Of AR Usage x Grade Level	1.01	0.3990

Note. (*) indicates that a response is significant at the 0.05 alpha level of significance

Initially, the test for interaction effects was conducted. The p-value for Type of AR Usage x Grade Level effects is 0.3990. This value exceeds the alpha level of significance of 0.05. The null hypothesis *no interaction effects* was not rejected. Testing for Type of AR Usage, a p-value of 0.0289 allowed for the null hypothesis *No Type Effects* to be rejected using an alpha level of 0.05. Examination of Grade Level Effects yields a p-value of 0.0536, which is able to accept the null hypothesis *No Grade Level Effects.* In summary, the data concluded that only Type of AR Usage affects the ERAS response. Therefore the amount of reading practice, reflected in AR Usage types, are related to reading attitude change.

Further analysis used Contrast Testing to compare Type of Reader (below) with (average & above) and produced an F value of 6.67 with corresponding p-value of 0.01. The null hypothesis was rejected due to the fact that the p-value is less than the alpha level of 0.05. Therefore, there was a difference of the ERAS responses between "below" and "average" and "above average" readers.

Summary

This chapter presented the results of the statistical analyses of the data gathered from the Gates-MacGinitie Test of Reading, Form L (MacGinitie & MacGinitie, 1989) and the Elementary Reading Attitude Scale (McKenna & Kear, 1990) as well as AR records. Statistical analysis were conducted on two hypotheses. In the first hypothesis, the relationship of reading vocabulary and reading comprehension to Accelerated Reader Usage and Grade Level was examined using a MANOVA format. In the second hypothesis, the relationship of reading attitude to Accelerated Reader Usage and Grade Level was examined using an ANOVA format.

Significant differences between pre-test and post-test assessments of vocabulary and reading comprehension occurred at the 0.05 level of significance for Type of Reader. At pre-testing at least 75% of all students tested below grade level in both reading vocabulary and comprehension. At post-testing, after AR treatment administration, the percentage of students testing below grade level for reading vocabulary and comprehension decreased in all grade levels.

A cross-tabulation of the two categories Type of AR Usage and Grade Level Type of Reader indicated that the greatest number of students obtained "Low AR Usage" status whereas the fewest number of students obtained "High AR Usage" status. By comparing the average growth in comprehension during the 1998 - 1999 school year for the low, average, and high AR usage groups it is seen that as AR usage grew, comprehension scores increased.

When mean differences were computed for vocabulary and comprehension, trends

revealed that as AR usage increased, mean differences in both dependent variables also increased. The relationship between the effects Type of AR Usage and Grade Level was explored statistically. Type of AR Usage and Grade Level were noted to be significant main effects.

The relationship between Type of Reader and Grade Level was examined by computing the mean difference in ERAS scores. When Type of AR Usage and Grade Level were analyzed, the null hypothesis *no interaction effects* was accepted. Testing for Type of AR Usage effects, the null hypothesis *No Type Effects* was rejected using an alpha level of 0.05. Examination of Grade Level Effects allowed for the null hypothesis *No Grade Level Effects* to be accepted. In summary, the ERAS data concluded that only Type of AR Usage affect the ERAS response in an additive manner.

Further analysis using Contrast Testing to compare Type of Reader (below grade level) with (average & above grade level) produced an F value that allowed for the null hypothesis to be rejected at the alpha level of 0.05. Therefore a significant difference in attitude responses between "below" versus "average/ above " readers was noted.

CHAPTER 5

CONCLUSIONS

This chapter examines findings of the current study, discusses implications, and makes recommendations for future research.

Implications

In this study, the pre-experimental design was the most viable option for the researcher. Classes were intact groups prohibiting randomization; a control group was not available. Therefore, certain variables were not controllable. For that reason, when examining the results, such limitations must be considered.

Conclusions

Positive Findings - Reading vocabulary and comprehension

This study examined readers according to Type of AR Usage, Grade Level, and Type of Reader (refer to Table l). At pre-testing, 75% of all third graders were below grade level in both reading vocabulary and comprehension. At post-testing, after exposure to the AR treatment for the duration of the school year, the below-grade level percentage had fallen dramatically. Additionally, review of data for the mean difference in vocabulary and comprehension by Grade Level and Type of AR Usage (refer to Table 5) indicated that as participation in the AR program increased, the mean score differences also increased. Both of the above findings support the AR program as a tool to improve reading comprehension and vocabulary in the low SES student population.

Adding the descriptive statistics, Type of Reader, provided additional information for analysis. Using a Multivariate Analysis of Variance (MANOVA) format, significant

differences between pre-test and post-test assessment of vocabulary and comprehension were noted for Type of Reader. In all test contrasts (refer to Table 2) the null hypothesis was rejected except for the case of Grade 3 versus Grade 4. It is likely that the treatment, AR usage, is responsible or partly responsible for these results. The effects of history on internal validity are difficult to evaluate in this study.

Multivariate Analysis of Variance (MANOVA) results (refer to Table 6) for the dependent variables difference in vocabulary and difference in comprehension indicated that Type of AR Usage and Grade Level effects were significant main effects. Interaction effects did not exist. Therefore, Hypothesis One is rejected:

When socioeconomic status is held constant, there is no difference in mean scores in vocabulary or comprehension as measured by the Gates-MacGinitie Test (MacGinitie & MacGinitie, 1989) in September/October 1998 and May/June 1999 when Accelerated Reader treatment is administered to urban learners in grades three, four, and five.

Positive Findings - Reading Attitude

The Analysis of Variance (ANOVA) was conducted on 515 observations using the Elementary Reading Attitude Scale (ERAS) (McKenna & Kear, 1990) and was not able to reject the null hypothesis, *no interaction effects.* The data concluded that only Type of AR Usage affects the dependent variable, attitude. Accordingly, the amount of reading practice, reflected in AR Usage types, are related to reading attitude change. There was a significant ERAS difference in mean scores between the below-grade level reader and the average grade level and above-average grade level reader.

Negative Findings - Reading vocabulary and comprehension

Frequency data for Type of AR Usage and Grade Level (refer to Table 3) is compelling evidence that participation in the AR program by this cohort group is weak.

Although the "low AR Usage" category provided the student with little actual reading practice, the greatest number of students obtained this status during the year-long study. Conversely, the "high AR Usage" category, a presumed target usage for readers, was obtained by the smallest number of students. The "average AR Usage" group composed 36.45% of the cohort sample, falling between the 51.8% "low AR Usage" and 11.8% "high AR Usage" groups.

The above results are disappointing, as reading is a skill which requires practice. Practice translates into the earning of AR points in the AR program. Advantage Learning Systems (1997), who promote the AR program, suggest that the student read an average of 30 minutes to an hour daily for the school year. In terms of points, approximately 100 are suggested as a goal for students, varying with grade level. In this study 100 points would have been obtained by those achieving "high AR Usage" status. Review of the results in this study indicate few students obtained 100 or more points. Therefore, the rewards of recreational reading, using AR, i.e. achievement gains in reading vocabulary, comprehension and attitude were largely unattained by this cohort sample due to poor participation.

Post-vocabulary and post-comprehension scores were used to obtain frequency and percentages of Type of AR Usage by Type of Reader (refer to Table 4). The "Low AR Usage" students who were "below grade level" in both vocabulary and comprehension at post-testing composed 33% of that category. Although these readers are most in need of recreational reading practice, they participated very minimally in the AR program. The "average AR Usage" readers in the "below grade level category" for post-vocabulary and post-comprehension measures comprised 18% and 16% of the sample respectively. The "high

AR Usage" student in the" below grade level" for post-vocabulary and comprehension category composed only 2% of the sample. Therefore readers who needed to read the most to improve vocabulary and comprehension skills did not read enough to do so.

The AR program did not significantly challenge the "on/above grade level" recreational reader to increase reading habits, as data indicates. In fact, the "on/above" grade level reader for post-vocabulary and comprehension measures most often was nearly as likely to be in the "low AR usage" category as the "average AR usage" category. Only approximately 9% of the "on/above grade level" readers for post-vocabulary and comprehension used the AR program to obtain "high AR usage" status.

In summary, review of the AR Usage data by Type of Reader indicated that recreational reading was not promoted in this population. In fact, over half of the cohort population obtained "low AR usage status". The "on/above grade level" reader composed only 9% of the "high AR Usage" group. The AR program, as a vehicle to promote the good reader to become a better reader, had limited participation by this cohort population.

Negative Findings - Reading Attitude

An Analysis of Variance (ANOVA) was used to test Hypothesis Two:

When socioeconomic status is held constant, there is no difference in the mean scores on the Elementary Reading Attitude Scale (ERAS) (McKenna & Kear, 1990) of third, fourth, and fifth grade students using the Accelerated Reader program for recreational reading from September 1998 through June 1999.

Analysis of ANOVA results indicated that the null hypothesis was rejected for Type effects. Grade Level and Type of AR Usage x Grade Level yielded non-significant p-values

that could not reject the null hypothesis in either case. Using the descriptor Type of Reader, an F-value and corresponding p-value were obtained that rejected the null hypothesis.

The relationship between Type of Reader and Grade Level was shown by computing mean difference in ERAS scores from post-testing to pre-testing (refer to Table 7). Many scores were negative, indicating that scores regressed at post-testing when compared to pre-test data. This may be attributed to statistical regression. Pilot testing of the ERAS might have suggested that this instrument was not suitable for this study. Interpretation of ERAS results are guarded.

Study Limitations and Recommendations for Future Researchers

Specifically, the following comments apply in retrospect to the current study's design and implementation. The AR reports were collected in June 1999; it is unclear of how the AR points were accumulated throughout the year. For example, tracking student's AR points on a weekly or monthly basis may have revealed temporal trends in using the AR program. Therefore a higher frequency in the collection of data is recommended in future research.

Students were assigned a descriptor "below grade level" or "on/above" grade level according to the operational definition by this researcher. This definition was not sensitive to specific degrees of magnitude e.g. a "below grade level" student label could apply to a student reading one month or three years below grade level. Instead of reporting exact changes in vocabulary and comprehension by months, category assignments were made e.g. "below grade level". Other operational definitions may have yielded more specific information.

Future researchers are encouraged to track the accumulation of AR points as well as precisely quantify "type of reader". More detailed information can be gained in this way.

Recommendations and Suggestions for Research

Increase Student Participation in the Accelerated Reader Program

Practical issues designed to increase student participation in recreational reading using the AR program in this urban school system should be the primary concern of administrators and teachers. It is essential that, in this public school system, the children are actually participating in recreational reading using the AR program. The presence of the AR program, without actual daily usage by students, is not helpful in improving reading vocabulary, comprehension, nor attitude.

The main priority for this population, and others of low SES, is to implement strategies that would significantly increase the recreational reading habits of all children. A special emphasis on increasing the recreational reading of the below-grade level reader is indicated by the vocabulary and comprehension data presented. Furthermore, examining those students who chose to use the AR program nominally could be valuable to understanding the reading needs of an emerging population of urban youth in elementary school.

Recreational reading is to become an instructional priority for this cohort population. Time in school for recreational reading must be considered when scheduling curriculum. A before-school and after-school AR program would provide uninterrupted quiet time for students to read recreationally.

Administration can ensure proper support personnel are hired and trained to manage the AR computer labs in good working order. Furthermore, teacher training, and student-parent orientations are essential to promoting optimal AR program growth. Concepts such as

the zone of proximal development (Dixondrauss, 1995) are important for teachers to monitor as well as parents to understand. By careful choice of appropriate books in the zone of proximal development, reading practice will promote maximum development (Paul, 1996). Therefore careful monitoring student's books as well as staff training is suggested by the current study. Incentives on an individual, classroom, and school-wide basis should be instituted and monitored by the building administrator as well as central administration. In addition, central administration support would highlight the importance of recreational reading system-wide, at all school levels. It would be of interest to tract the long-term effects of the AR program as students progress from elementary to middle to high school. Trends may emerge which would call attention to present curriculum priorities.

Study Factors Affecting Reading Performance

It is known that the home environment, reading materials in the home, and being read to regularly affect reading skills acquisition and foster higher levels of reading achievement (Crain-Thoreson & Dale, 1992; Durkin, 1966; Hess, Holloway, Price & Dickson, 1982). Therefore, school administrators, professional staff, and research personnel are encouraged to study whether or not students are in environments conducive to reading at school and home as well. A survey of literature available in classrooms and school libraries is suggested. Parental response to literacy may yield valuable information. Programs to promote family literacy may be an important component in a school system's literary design. Research in the area of family literacy for this population should be considered. If students' home environments are not promoting reading, the implementation of before-and-after school literary programs may be needed.

Summary

Results of the current study concluded that recreational reading, using AR, increases reading vocabulary, comprehension and attitude when utilized as intended.

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APPENDIX A

DATA

The SAS System

OBS	GRADE	PREVOC	POSTVOC	PRECOMP	POSTCOMP	PREERAS	POSTERAS	AR
1	4	1.7	3.7	1.9	1.3	72	97	10.8
2	4	5.1	7.9	6.1	5.4	.	.	1.4
3	4	2.7	2.8	3.0	2.6	.	.	3.4
4	4	2.8	2.8	2.6	2.7	.	.	2.8
5	4	2.4	3.0	3.3	2.5	.	.	3.2
6	4	2.3	1.6	1.9	1.4	.	.	6.9
7	4	3.9	2.8	3.5	3.2	.	.	8.5
8	4	2.3	2.9	3.1	2.5	20	59	6.5
9	4	2.6	2.3	2.6	1.6	26	18	3.7
10	4	2.8	4.6	2.6	2.5	32	23	3.1
11	5	2.6	3.4	3.3	3.2	0	1	1.3
12	5	2.6	2.6	3.2	2.5	61	76	7.4
13	5	3.7	3.1	5.4	4.2	76	91	4.9
14	5	5.4	6.2	6.5	6.4	.	.	6.5
15	5	5.5	5.3	4.7	4.6	.	.	11.2
16	5	4.2	3.9	5.4	3.6	.	.	0.0
17	5	5.0	3.9	5.4	3.9	.	.	0.0
18	5	4.2	3.5	4.5	4.4	.	.	0.5
19	5	3.4	2.7	4.1	3.6	.	.	0.0
20	5	3.3	2.4	4.2	4.1	.	.	0.9
21	5	2.8	3.0	3.0	2.9	.	.	0.7
22	5	3.7	3.0	3.6	2.7	89	50	10.0
23	5	7.6	6.5	10.7	8.5	82	97	1.0
24	5	3.7	3.0	5.5	5.1	17	8	8.3
25	3	2.4	2.3	2.2	1.5	67	25	8.5
26	3	2.2	2.5	1.6	1.5	84	64	7.4
27	4	2.1	2.8	2.6	2.3	93	53	4.8
28	4	2.3	2.1	2.3	1.9	18	35	10.9
29	4	1.3	2.3	3.4	3.0	12	26	5.7
30	5	6.5	7.3	13.0	7.3	92	91	7.4
31	5	4.5	4.6	5.7	4.2	42	26	5.8
32	5	3.6	3.7	6.5	5.7	99	97	8.0
33	5	4.3	5.3	4.6	2.7	.	.	0.0
34	5	5.0	5.0	3.6	3.5	76	70	0.9
35	5	2.8	4.3	3.0	2.3	94	82	2.0
36	5	5.0	2.2	4.6	1.8	67	19	9.3
37	5	5.5	2.4	3.3	2.3	42	67	10.0
38	5	4.4	1.7	4.5	2.0	64	76	10.6
39	5	3.6	3.1	3.0	2.5	20	61	0.0
40	5	2.6	2.7	3.6	2.2	.	.	0.0
41	5	2.8	2.2	2.6	2.0	23	84	3.7
42	5	5.0	6.5	5.5	4.5	94	94	4.8
43	5	2.4	2.6	2.2	1.6	99	96	0.5
44	4	3.1	3.2	4.2	4.2	48	88	4.4
45	5	3.1	3.7	2.6	2.4	23	15	6.1
46	3	1.9	2.4	1.6	1.4	79	38	1.6
47	4	2.3	2.5	2.6	2.5	95	78	9.3
48	4	4.8	3.1	2.5	1.6	97	78	7.7
49	4	4.5	5.6	4.5	2.7	35	95	10.0
50	4	2.3	2.7	2.4	1.9	26	23	6.1

The SAS System

OBS	GRADE	PREVOC	POSTVOC	PRECOMP	POSTCOMP	PREERAS	POSTERAS	AR
51	4	3.3	4.2	2.6	2.5	35	5	8.9
52	4	4.7	4.7	4.6	4.5	62	56	7.4
53	4	2.5	3.5	3.0	2.2	.	.	4.8
54	4	4.3	4.5	2.5	2.3	.	.	2.0
55	5	4.6	6.1	3.5	2.3	.	.	7.8
56	5	5.0	5.7	8.2	7.3	12	57	0.0
57	5	4.5	4.4	2.6	2.4	.	.	3.8
58	5	3.7	3.4	2.2	2.0	50	84	0.0
59	5	3.4	3.1	2.4	2.4	87	10	0.9
60	3	2.0	2.4	1.7	1.6	51	13	4.6
61	5	2.3	2.6	3.0	2.7	36	13	3.9
62	5	2.5	2.6	3.0	2.2	98	92	7.9
63	5	1.8	2.1	3.6	3.4	87	84	0.0
64	5	2.2	2.6	3.3	3.0	84	61	0.0
65	5	2.6	3.0	4.2	3.7	33	13	0.0
66	5	4.4	4.6	3.6	3.4	79	33	0.0
67	5	2.7	3.6	6.2	6.1	97	67	0.5
68	4	5.5	6.6	5.6	5.2	78	78	0.0
69	5	3.3	3.5	4.6	4.2	84	82	10.4
70	4	4.4	4.8	5.4	5.3	95	95	10.1
71	5	3.2	3.4	3.0	2.5	52	23	3.3
72	3	2.4	3.2	2.7	2.2	.	.	4.7
73	5	3.9	2.9	3.6	3.6	.	.	8.3
74	5	3.3	3.3	2.7	2.7	79	23	2.2
75	4	2.1	3.1	2.3	2.3	41	23	5.5
76	5	3.1	3.1	3.5	3.5	73	91	0.0
77	5	5.3	6.1	6.5	6.5	46	2	9.6
78	3	2.1	2.2	2.0	2.0	81	34	6.9
79	4	2.4	2.2	1.6	1.6	66	59	6.0
80	5	3.1	4.6	1.7	1.7	.	.	9.2
81	5	6.7	8.0	8.2	8.2	89	64	2.1
82	5	1.7	3.1	2.4	2.5	.	.	0.0
83	5	2.2	1.6	1.6	0.3	61	87	0.3
84	4	3.7	4.3	2.6	2.7	32	93	7.7
85	4	3.3	3.7	2.5	2.6	53	6	1.5
86	4	3.1	4.2	2.3	2.4	.	.	10.2
87	3	1.3	1.4	1.3	1.4	55	25	0.0
88	5	1.8	2.4	1.7	1.8	70	36	0.3
89	4	2.7	2.8	2.0	2.2	.	.	4.2
90	5	4.3	3.0	4.1	4.3	.	.	0.0
91	5	3.3	3.1	2.3	2.5	73	92	5.9
92	5	2.8	5.4	3.0	3.2	15	36	0.4
93	4	1.9	2.7	1.7	1.9	98	98	10.4
94	4	3.0	3.7	1.7	1.9	.	.	0.8
95	3	1.7	1.9	2.1	2.3	34	35	8.5
96	5	2.2	2.5	3.3	3.5	98	33	6.9
97	4	3.1	3.3	2.2	2.5	56	99	6.4
98	5	3.4	3.1	2.7	3.0	13	26	9.4
99	4	4.9	5.5	3.4	3.7	59	75	7.7
100	5	3.7	2.6	3.0	3.3	61	13	3.2

The SAS System

OBS	GRADE	PREVOC	POSTVOC	PRECOMP	POSTCOMP	PREERAS	POSTERAS	AR
101	5	3.6	4.5	4.1	4.4	23	50	4.1
102	5	4.3	5.1	4.4	4.7	.	.	6.5
103	4	2.5	2.7	1.6	1.9	.	.	3.9
104	4	2.8	3.6	3.4	3.7	72	45	7.8
105	4	3.0	5.2	2.7	3.0	18	62	0.8
106	3	1.4	2.3	1.7	2.0	.	.	2.6
107	3	1.7	2.7	2.3	2.6	.	.	5.7
108	4	2.4	3.3	2.2	2.6	26	35	3.5
109	5	4.3	4.4	4.1	4.5	.	.	0.0
110	3	2.5	3.0	1.9	2.3	.	.	6.6
111	4	2.5	3.0	2.0	2.4	59	9	6.2
112	4	4.3	4.5	3.2	3.6	83	69	3.2
113	5	2.6	3.6	3.2	3.6	84	84	10.0
114	5	3.2	3.2	4.1	4.5	89	76	0.5
115	5	3.3	4.3	4.7	5.1	84	79	0.5
116	4	4.2	4.2	3.7	4.2	20	45	3.8
117	5	2.8	3.1	3.0	3.5	.	.	0.5
118	3	2.0	2.5	1.4	2.7	.	.	5.0
119	3	2.3	3.6	2.5	3.6	.	.	2.2
120	5	5.5	7.3	5.5	6.0	95	91	7.3
121	3	1.6	1.7	1.5	2.0	20	9	0.3
122	3	2.4	2.6	1.6	2.1	99	64	0.4
123	5	1.7	4.3	2.5	3.0	53	12	6.0
124	4	2.7	3.1	2.5	3.0	53	26	0.0
125	5	1.6	5.1	2.7	3.2	.	.	6.2
126	4	2.5	2.7	1.9	2.5	45	38	9.2
127	5	5.0	4.5	5.5	6.1	67	92	3.3
128	5	4.7	6.7	4.6	5.2	97	70	9.4
129	3	3.1	4.4	3.7	4.3	67	79	3.5
130	4	2.4	3.3	1.9	2.5	83	59	10.4
131	3	2.2	3.2	1.5	2.1	.	.	5.7
132	4	2.9	3.6	2.0	2.6	.	.	3.9
133	5	4.5	3.4	3.6	4.3	.	.	0.0
134	5	3.9	3.6	4.6	5.3	9	53	0.9
135	5	5.0	3.0	2.3	3.0	.	.	0.0
136	4	2.5	2.9	1.9	2.6	13	28	8.8
137	4	4.4	4.5	2.6	3.3	20	78	9.5
138	4	1.6	3.4	2.0	2.7	53	89	6.0
139	3	1.6	3.1	1.7	2.4	.	.	5.3
140	4	2.4	3.3	1.6	2.3	69	59	9.5
141	4	3.3	3.1	1.9	2.7	86	48	5.2
142	4	2.1	3.5	2.2	3.0	35	38	6.1
143	4	3.3	5.6	3.7	4.5	95	45	8.7
144	4	3.2	3.4	1.7	2.5	32	41	7.4
145	5	4.2	5.1	4.4	5.2	84	84	0.3
146	4	2.3	3.9	1.9	2.7	10	16	9.6
147	5	1.7	4.2	1.6	2.4	95	8	6.3
148	5	6.3	7.0	6.5	7.3	97	87	9.9
149	5	4.5	4.6	2.7	3.5	67	8	7.5
150	5	3.1	4.3	2.4	3.2	.	.	5.8

The SAS System

OBS	GRADE	PREVOC	POSTVOC	PRECOMP	POSTCOMP	PREERAS	POSTERAS	AR
151	5	1.8	2.7	1.7	2.5	70	57	4.3
152	3	1.6	2.6	2.3	3.1	.	.	3.8
153	4	3.7	3.7	3.6	4.5	75	20	2.2
154	4	2.8	3.5	2.6	3.5	99	69	9.0
155	4	3.0	2.5	2.5	3.4	38	56	2.3
156	4	2.3	3.3	3.2	4.1	13	53	10.3
157	4	2.7	2.8	1.6	2.5	32	35	10.9
158	5	2.8	3.4	1.6	2.5	.	.	7.4
159	5	4.3	4.3	2.1	3.0	92	95	7.9
160	3	3.2	4.7	2.5	3.4	96	84	7.7
161	4	3.1	3.5	1.3	2.2	.	.	10.4
162	4	4.3	5.6	2.5	3.4	.	.	7.5
163	5	4.5	4.6	3.6	4.5	.	.	3.7
164	3	1.7	2.7	1.3	2.2	.	.	1.4
165	5	5.4	4.3	7.7	6.7	73	53	4.9
166	5	3.3	3.6	4.6	5.6	61	67	3.8
167	4	1.6	2.9	1.3	2.3	56	95	6.9
168	5	4.7	4.2	4.5	5.5	4	8	0.5
169	3	2.7	5.7	3.3	4.3	.	.	6.9
170	4	2.5	3.3	2.6	3.7	99	99	10.4
171	4	3.3	3.9	1.6	2.7	28	95	0.5
172	4	2.5	3.0	3.3	2.4	13	72	0.3
173	4	1.9	2.5	1.4	2.5	38	2	8.8
174	5	3.9	4.7	2.5	3.6	61	42	6.3
175	5	3.4	4.3	3.3	4.4	92	94	6.0
176	3	2.7	3.1	1.1	2.2	.	.	9.9
177	5	4.4	5.5	4.2	5.4	73	61	6.2
178	4	2.9	4.3	3.0	4.2	.	.	8.0
179	4	1.7	3.0	1.4	2.6	.	.	10.2
180	5	2.7	3.1	3.2	4.4	98	96	0.0
181	4	3.3	3.9	2.2	3.4	91	60	8.0
182	5	4.3	4.5	3.3	4.5	.	.	4.0
183	3	1.7	2.8	1.7	3.0	.	.	4.9
184	4	2.9	3.6	2.0	3.3	83	78	0.5
185	4	4.6	3.9	1.9	3.2	.	.	7.1
186	5	3.1	4.5	2.0	3.3	8	10	7.1
187	3	1.6	2.3	1.4	2.7	.	.	2.7
188	5	3.6	3.4	4.1	5.5	46	53	3.0
189	3	2.3	3.3	2.0	3.4	99	95	5.1
190	4	1.9	3.3	1.9	3.3	78	72	6.7
191	5	3.1	3.3	3.2	4.6	64	73	0.9
192	5	4.5	3.2	3.0	4.4	67	82	4.2
193	4	2.8	3.4	1.9	3.3	35	35	8.9
194	4	3.2	3.6	1.9	3.3	.	.	8.5
195	4	2.1	3.4	2.0	3.4	48	78	1.0
196	5	2.6	4.3	1.7	3.2	.	.	9.0
197	4	1.7	3.0	1.7	3.2	.	.	3.5
198	5	3.4	5.0	6.2	7.7	29	29	9.8
199	4	2.5	3.9	1.9	3.4	32	7	8.0
200	4	3.4	3.7	4.5	5.6	88	78	1.5

The SAS System

OBS	GRADE	PREVOC	POSTVOC	PRECOMP	POSTCOMP	PREERAS	POSTERAS	AR
201	5	3.6	4.3	3.0	4.6	.	.	7.7
202	4	3.3	3.4	2.5	4.1	6	41	6.1
203	3	1.4	2.9	1.6	3.3	.	.	7.3
204	3	2.0	3.2	1.5	3.2	23	8	1.3
205	5	4.2	4.6	2.4	4.1	46	64	4.7
206	5	4.4	5.4	4.5	6.2	29	23	4.7
207	5	2.6	3.4	1.7	3.4	1	8	3.6
208	3	2.6	4.8	3.5	5.3	.	.	6.0
209	5	3.2	3.2	2.6	4.4	97	79	3.0
210	5	3.7	4.6	3.6	5.4	12	82	1.2
211	4	3.7	4.4	3.3	5.1	86	72	5.0
212	5	5.7	5.7	2.7	4.6	53	33	3.2
213	5	4.3	4.5	2.7	4.6	33	3	9.5
214	5	3.4	3.9	2.2	4.1	53	17	0.3
215	4	3.1	3.5	2.3	4.2	88	75	1.4
216	4	2.7	3.4	3.2	5.1	41	10	7.3
217	4	3.6	4.6	3.5	5.4	16	23	7.4
218	3	2.1	2.5	1.5	3.5	.	.	7.8
219	4	3.2	3.2	1.5	1.6	.	.	7.6
220	5	3.3	4.8	3.0	5.1	23	57	0.7
221	4	2.9	3.7	2.0	4.1	.	.	0.5
222	5	4.3	3.9	2.2	4.3	.	.	2.2
223	3	1.6	3.3	1.1	3.3	.	.	2.4
224	4	2.9	3.9	3.0	5.2	.	.	1.5
225	5	3.3	3.6	2.0	4.4	67	33	0.4
226	5	5.5	4.8	4.4	6.7	.	.	0.0
227	5	3.1	4.3	4.4	6.8	36	50	0.5
228	3	2.2	3.5	2.2	3.7	.	.	9.0
229	3	2.7	3.9	1.6	4.1	79	31	1.5
230	5	3.9	3.6	2.7	5.2	79	84	5.3
231	3	1.6	4.4	2.0	4.6	.	.	2.4
232	4	3.3	3.0	2.9	4.5	62	45	4.3
233	4	2.1	3.5	1.5	4.2	75	86	9.0
234	5	4.2	3.2	3.6	4.2	89	67	15.2
235	5	6.1	4.5	7.3	5.4	61	50	25.9
236	5	5.5	4.3	4.4	4.5	15	6	15.0
237	5	4.5	4.8	4.5	4.5	89	87	25.5
238	5	3.9	2.7	5.4	3.7	69	67	15.9
239	5	5.0	5.1	2.7	5.1	82	70	14.8
240	4	3.3	3.7	3.0	4.2	0	20	25.1
241	4	3.4	3.7	3.0	2.7	35	62	11.4
242	4	4.2	4.9	3.5	5.1	48	72	21.1
243	4	4.0	4.9	4.6	6.1	48	45	13.0
244	4	5.2	6.6	3.7	5.1	38	44	11.1
245	4	4.9	6.6	6.1	5.6	38	66	11.0
246	4	3.3	4.2	1.9	3.4	48	56	18.4
247	4	3.1	3.9	2.5	3.3	26	35	13.7
248	4	3.3	3.6	2.7	3.4	28	28	13.2
249	4	3.5	2.9	2.5	2.5	62	56	17.7
250	4	4.4	6.3	8.7	8.1	.	.	14.8

The SAS System

OBS	GRADE	PREVOC	POSTVOC	PRECOMP	POSTCOMP	PREERAS	POSTERAS	AR
251	4	4.6	6.3	8.1	6.1	.	.	17.6
252	4	3.4	4.9	4.2	5.4	62	56	20.2
253	4	4.4	7.9	4.3	10.7	78	69	13.1
254	4	1.4	4.2	3.3	6.1	.	.	22.1
255	4	2.4	3.0	3.4	3.4	.	.	11.1
256	4	3.7	4.6	3.3	4.2	.	.	11.1
257	4	3.3	4.2	3.5	4.3	41	23	15.5
258	4	3.4	4.5	5.4	6.1	80	78	20.4
259	5	2.4	4.6	2.6	5.7	96	98	14.2
260	5	3.9	3.7	1.7	2.7	26	29	11.0
261	5	3.6	4.3	2.7	5.7	89	91	11.8
262	5	5.3	7.0	4.5	6.2	70	57	13.1
263	5	5.4	7.0	6.2	9.5	64	61	11.5
264	5	5.3	5.7	7.3	9.5	70	57	13.4
265	5	4.3	1.7	2.8	2.4	53	65	12.7
266	5	4.4	2.4	1.8	1.8	.	.	16.5
267	5	3.4	1.7	3.0	2.0	23	42	22.8
268	5	5.0	1.9	2.5	2.2	91	90	18.5
269	5	3.9	2.8	4.5	2.0	97	53	13.2
270	5	5.4	3.1	5.2	2.7	.	.	24.4
271	5	6.1	1.9	6.8	1.8	.	.	20.4
272	5	4.3	5.0	5.5	6.5	76	91	24.2
273	5	3.7	4.2	2.2	2.4	9	29	23.9
274	5	3.4	3.0	3.2	4.5	87	91	11.2
275	4	2.4	2.9	2.2	4.2	59	62	13.5
276	4	3.0	4.2	2.3	3.5	5	16	14.5
277	4	4.4	3.5	3.0	4.1	28	91	25.8
278	4	3.9	4.7	4.2	5.1	72	78	15.8
279	4	4.9	6.0	8.1	8.1	86	86	16.3
280	4	2.4	2.5	1.7	2.2	93	72	15.2
281	4	2.7	3.1	1.9	2.2	0	9	15.1
282	4	3.0	3.1	2.6	2.5	85	53	19.6
283	4	3.6	4.2	1.9	7.1	91	83	11.5
284	4	2.9	3.3	2.7	3.7	91	91	24.7
285	4	3.1	3.6	3.2	3.7	78	35	15.1
286	4	3.4	4.3	3.2	4.3	78	53	20.5
287	4	4.5	4.4	3.2	3.2	93	53	11.2
288	4	1.9	4.3	1.7	3.6	.	.	14.2
289	4	2.4	4.2	1.6	2.0	53	0	15.7
290	4	1.7	4.4	2.2	4.5	.	.	23.1
291	4	2.6	4.3	1.9	3.3	89	78	21.3
292	4	2.8	4.3	2.0	3.5	48	38	19.8
293	4	2.6	4.4	2.3	8.7	35	6	22.9
294	4	3.0	4.4	2.2	3.0	78	82	15.9
295	4	3.9	5.4	1.9	3.2	9	9	14.7
296	4	3.3	4.6	2.7	2.7	.	.	16.3
297	4	3.7	3.6	5.6	4.4	62	63	11.3
298	5	3.5	4.2	2.7	4.3	.	.	32.2
299	5	4.8	5.3	3.6	4.5	.	.	30.8
300	5	2.0	3.7	4.2	2.3	.	.	30.3

The SAS System

OBS	GRADE	PREVOC	POSTVOC	PRECOMP	POSTCOMP	PREERAS	POSTERAS	AR
301	5	3.3	2.5	2.2	2.8	.	.	38.1
302	5	4.6	5.1	5.8	5.2	.	.	29.1
303	5	2.6	3.4	4.2	2.5	.	.	46.7
304	5	4.2	3.4	3.0	4.6	.	.	37.8
305	5	6.8	3.6	3.5	4.2	.	.	30.3
306	5	3.5	5.1	2.1	3.0	.	.	34.5
307	5	1.6	6.3	2.7	5.4	.	.	35.0
308	5	3.1	3.9	3.2	4.4	.	.	49.4
309	4	3.2	3.5	2.5	4.6	83	95	31.1
310	4	4.1	5.2	2.4	8.1	98	94	40.6
311	4	2.5	3.2	2.4	4.2	97	66	27.7
312	4	1.3	2.9	1.8	3.4	93	96	30.9
313	4	2.9	3.5	2.5	4.1	99	93	38.1
314	4	3.4	4.2	3.5	5.4	.	.	46.2
315	4	3.0	3.7	1.4	3.2	32	94	32.6
316	4	3.0	3.1	2.7	3.5	62	62	35.1
317	4	2.5	3.0	2.6	4.2	91	91	48.7
318	4	3.4	4.5	1.8	4.5	95	94	35.1
319	4	3.5	4.5	4.5	3.7	67	78	32.2
320	4	3.0	3.7	3.4	3.4	62	66	48.7
321	4	2.7	3.6	2.2	2.7	59	62	32.7
322	4	2.7	3.9	1.7	5.1	67	80	47.8
323	3	2.4	3.5	2.6	4.1	.	.	47.4
324	4	2.5	2.3	1.7	3.0	20	26	33.0
325	3	2.4	3.3	3.1	3.4	61	23	27.3
326	3	4.2	4.6	4.7	4.5	79	51	29.1
327	4	5.7	6.5	7.7	7.3	91	94	47.3
328	4	2.9	3.4	2.5	4.2	93	78	31.4
329	4	2.1	2.4	2.5	3.2	56	83	29.3
330	3	2.7	6.7	3.7	7.7	.	.	48.2
331	3	3.5	4.2	3.0	5.4	.	.	31.7
332	3	1.2	2.7	2.1	2.4	.	.	44.9
333	5	3.3	4.3	3.2	5.2	76	98	33.0
334	5	2.2	2.2	2.4	5.2	84	89	8.6
335	5	2.6	4.2	1.6	4.5	39	50	7.2
336	3	2.2	4.6	2.6	5.5	.	.	7.4
337	5	4.2	5.0	3.6	6.5	82	82	6.3
338	5	4.3	4.5	2.6	5.5	70	53	8.9
339	5	3.6	4.3	2.4	5.4	20	23	6.7
340	5	3.6	4.5	2.4	5.4	94	79	7.6
341	5	4.7	5.7	4.7	7.7	64	76	8.0
342	4	6.0	9.1	8.7	10.7	28	32	5.2
343	5	7.0	7.6	8.6	11.7	53	73	7.4
344	5	4.8	4.3	4.1	7.3	.	.	8.0
345	4	6.3	9.1	4.1	7.5	.	.	0.5
346	3	3.0	5.4	3.0	6.5	.	.	7.8
347	5	6.1	7.6	2.6	6.2	23	23	2.2
348	4	4.4	5.6	3.0	7.1	41	26	5.8
349	5	4.3	4.4	4.1	8.2	57	89	8.8
350	3	3.3	4.4	2.3	7.2	76	89	3.2

The SAS System

OBS	GRADE	PREVOC	POSTVOC	PRECOMP	POSTCOMP	PREERAS	POSTERAS	AR
351	3	2.8	3.9	2.3	7.2	.	.	10.8
352	4	10.7	9.1	6.3	12.3	69	62	6.8
353	5	5.7	6.1	1.5	7.7	91	87	2.9
354	4	4.7	5.3	4.1	11.5	69	78	0.0
355	5	5.0	7.3	2.7	13.0	73	84	9.5
356	5	2.2	2.8	2.5	2.8	.	.	23.2
357	5	3.1	3.2	3.5	2.8	.	.	19.2
358	5	3.3	5.4	3.4	4.8	.	.	14.6
359	5	4.1	4.4	2.4	4.8	.	.	15.7
360	5	2.0	5.4	4.2	4.8	.	.	22.2
361	5	3.6	3.7	3.4	3.5	.	.	17.6
362	5	4.8	6.3	4.1	4.3	.	.	21.9
363	5	3.5	3.3	1.9	1.8	.	.	22.0
364	4	2.5	2.9	2.0	3.4	20	32	11.2
365	4	3.7	5.1	2.2	4.5	99	28	13.8
366	4	2.4	2.8	2.3	2.6	99	98	22.0
367	4	3.2	4.3	2.2	3.2	99	97	23.8
368	4	2.5	3.7	2.2	3.7	.	.	12.0
369	4	2.6	3.7	1.6	4.2	.	.	13.9
370	4	1.8	2.7	2.2	3.7	94	75	16.4
371	4	2.1	3.9	2.5	3.0	88	91	20.6
372	4	3.0	4.2	3.4	4.6	62	80	24.5
373	4	1.6	2.7	2.4	4.5	80	95	21.3
374	4	2.2	3.3	1.8	4.3	38	99	14.4
375	4	2.9	4.2	2.4	3.4	83	48	23.0
376	4	1.7	2.6	2.6	3.6	83	93	25.9
377	4	2.6	2.7	2.1	1.7	13	62	19.2
378	4	2.1	2.3	1.6	1.7	83	94	25.3
379	3	1.4	2.2	2.3	3.0	.	.	22.6
380	3	2.4	3.1	3.2	3.5	.	.	22.4
381	3	2.6	3.7	1.3	4.1	.	.	17.3
382	3	2.4	3.1	1.1	3.7	.	.	19.0
383	3	2.2	2.5	1.5	2.7	.	.	19.4
384	3	2.7	4.5	2.8	3.7	.	.	25.2
385	3	2.1	4.5	2.8	4.3	.	.	11.4
386	3	1.7	4.4	2.8	3.3	.	.	11.0
387	3	2.7	6.3	3.0	5.7	.	.	25.6
388	5	4.2	3.9	2.4	4.5	53	50	14.8
389	5	6.2	5.2	0.7	13.0	99	98	15.8
390	5	2.0	2.9	3.2	3.6	50	79	14.5
391	5	2.4	2.6	2.6	2.0	87	53	18.6
392	5	1.8	2.5	2.0	3.6	57	26	14.4
393	3	1.9	2.2	2.0	2.0	9	34	13.6
394	3	2.8	3.6	1.9	2.3	64	76	11.9
395	3	2.7	3.5	2.7	2.4	55	67	15.3
396	3	3.6	3.5	3.3	4.7	89	11	16.3
397	5	3.9	5.5	5.7	4.1	95	64	17.6
398	5	5.3	6.3	4.5	4.4	.	.	18.4
399	5	2.8	3.3	2.4	1.6	.	.	18.1
400	5	4.4	4.7	3.2	4.5	.	.	12.7

The SAS System

OBS	GRADE	PREVOC	POSTVOC	PRECOMP	POSTCOMP	PREERAS	POSTERAS	AR
401	5	4.4	4.5	2.5	3.0	.	.	16.4
402	5	4.3	5.0	4.1	4.7	.	.	20.1
403	4	1.4	2.3	1.4	2.6	62	93	25.2
404	4	2.1	2.4	1.4	1.7	32	18	23.2
405	4	1.5	2.8	1.7	1.6	66	89	17.9
406	4	2.8	3.2	1.7	2.0	62	89	20.1
407	4	1.7	2.8	3.0	2.0	17	20	11.5
408	4	4.3	5.3	2.0	4.6	66	38	14.2
409	4	3.5	4.6	2.5	3.6	59	91	16.2
410	4	3.0	3.9	2.5	8.1	66	23	14.2
411	4	3.3	3.7	3.2	5.4	53	59	24.2
412	4	4.2	5.1	2.5	5.4	69	38	13.6
413	4	3.3	5.5	3.5	6.1	7	23	19.0
414	4	4.2	4.6	2.7	5.4	91	41	16.8
415	4	3.9	4.9	3.5	6.4	26	9	22.6
416	3	2.3	3.7	3.3	2.3	.	.	22.5
417	5	3.6	4.3	4.3	3.0	.	.	13.9
418	5	3.4	3.9	2.7	5.5	61	85	20.1
419	5	3.6	4.5	3.6	7.3	57	33	13.9
420	5	3.9	4.2	3.6	4.6	61	20	17.0
421	5	4.7	3.7	4.1	4.2	42	29	17.7
422	5	5.3	6.5	4.1	5.4	42	17	20.3
423	5	5.0	5.4	5.6	7.3	73	77	18.9
424	5	5.0	5.1	6.3	6.2	36	79	25.9
425	5	6.5	9.5	6.5	6.5	89	94	17.7
426	5	3.3	4.3	2.4	4.6	53	15	24.5
427	5	2.8	4.5	3.2	4.2	82	87	24.0
428	5	3.3	3.6	3.2	5.5	53	79	25.7
429	5	2.2	5.3	3.2	4.6	3	64	12.9
430	5	3.1	4.2	4.1	4.2	61	89	15.6
431	5	3.3	6.7	4.5	13.0	12	82	15.5
432	5	5.1	7.3	8.1	7.3	82	70	18.9
433	4	1.6	2.4	2.2	3.6	41	18	24.9
434	4	2.4	3.3	2.6	3.6	16	23	11.5
435	4	2.7	3.6	2.5	3.7	26	32	20.9
436	4	3.0	3.3	2.5	4.3	.	.	25.9
437	4	1.7	2.8	1.4	3.6	.	.	17.5
438	3	2.7	3.2	1.7	2.4	84	95	24.3
439	3	2.1	3.1	1.5	2.0	17	38	15.4
440	3	1.6	2.8	2.1	2.3	89	20	25.6
441	3	4.3	4.6	2.5	3.5	95	48	14.6
442	3	1.9	1.7	1.2	1.5	70	51	17.6
443	3	1.7	2.8	1.3	2.6	28	46	25.0
444	3	1.7	3.0	1.6	3.4	3	23	16.8
445	3	2.0	2.6	1.7	3.1	13	58	15.5
446	5	3.4	4.4	2.4	4.6	.	.	23.9
447	5	4.2	5.3	2.6	5.5	89	50	14.1
448	5	4.2	4.3	3.3	6.2	.	.	25.2
449	5	5.0	5.1	2.2	6.2	46	42	23.9
450	5	3.9	5.0	3.6	5.9	97	96	17.4

The SAS System

OBS	GRADE	PREVOC	POSTVOC	PRECOMP	POSTCOMP	PREERAS	POSTERAS	AR
451	5	4.5	6.5	3.0	6.8	76	87	25.9
452	4	2.3	2.4	1.5	3.5	45	62	13.2
453	4	2.1	1.6	2.5	2.2	41	48	12.2
454	4	3.2	3.0	1.9	1.9	6	9	19.1
455	4	3.2	4.4	2.6	5.1	13	56	18.0
456	4	4.3	5.2	1.7	4.1	32	56	18.0
457	4	3.6	3.0	2.3	3.2	45	41	13.1
458	4	3.1	3.9	3.6	4.6	53	66	21.6
459	4	3.4	4.5	2.7	4.1	62	38	11.2
460	4	3.7	4.7	4.1	4.5	83	53	20.2
461	4	4.3	4.4	4.6	5.6	91	86	16.8
462	4	2.1	1.5	1.7	2.4	20	72	11.2
463	4	3.3	3.6	2.2	2.6	62	53	11.7
464	4	3.1	3.6	2.4	3.5	75	56	16.9
465	4	3.4	3.9	2.4	4.4	48	53	19.3
466	4	3.3	3.5	3.5	4.5	69	80	12.6
467	3	2.2	2.7	1.4	2.3	1	48	11.9
468	3	1.7	2.5	1.4	2.0	.	.	11.8
469	3	2.2	2.7	1.2	2.1	.	.	11.8
470	3	2.5	3.1	1.3	2.5	.	.	23.7
471	3	1.7	2.7	1.2	2.6	23	20	19.2
472	3	1.6	2.7	1.5	2.3	.	.	21.3
473	3	2.1	3.0	1.6	5.3	44	17	19.4
474	3	2.1	2.2	1.7	2.0	38	2	19.2
475	3	2.6	2.8	1.5	3.1	9	23	20.7
476	3	2.3	2.7	2.3	2.7	73	44	24.2
477	3	3.2	4.4	3.2	3.4	25	2	25.9
478	3	2.2	3.1	1.5	2.5	25	26	18.7
479	3	2.5	4.3	1.6	2.7	34	73	25.0
480	3	1.7	2.2	1.7	2.3	44	15	14.1
481	3	1.7	2.1	1.9	1.7	.	.	14.7
482	3	2.0	2.2	2.1	2.0	.	.	12.1
483	3	2.3	2.2	1.9	1.9	73	12	21.6
484	3	2.4	2.6	1.9	1.9	.	.	21.8
485	3	2.3	2.3	2.1	1.7	2	0	11.8
486	5	2.6	4.3	2.6	4.5	89	82	21.3
487	3	2.7	3.3	1.7	3.3	20	28	14.8
488	3	3.9	4.3	2.7	3.4	.	.	21.2
489	3	2.3	4.4	2.1	2.6	.	.	15.8
490	3	2.5	4.3	3.1	4.1	.	.	14.7
491	3	3.3	3.5	2.7	3.7	.	.	16.2
492	3	3.3	3.9	3.1	7.2	.	.	11.2
493	5	5.7	4.8	5.2	4.5	26	53	13.0
494	5	3.6	3.0	2.7	4.2	46	2	23.9
495	5	3.9	3.0	3.2	4.5	61	73	15.8
496	5	6.3	5.5	4.5	3.2	73	7	11.7
497	5	3.3	3.2	3.0	3.5	20	33	22.0
498	3	4.2	3.6	3.3	3.6	79	13	12.0
499	5	4.3	3.4	2.6	5.2	96	97	40.5
500	5	3.4	4.3	4.7	7.3	96	87	26.6

The SAS System

OBS	GRADE	PREVOC	POSTVOC	PRECOMP	POSTCOMP	PREERAS	POSTERAS	AR
501	5	5.3	5.7	4.2	7.7	53	36	33.4
502	5	4.6	4.5	7.0	10.3	99	67	45.2
503	5	1.9	3.6	2.4	4.4	89	70	35.1
504	5	2.4	4.2	2.7	4.1	33	87	33.8
505	5	3.4	3.9	2.7	3.0	92	95	26.1
506	5	3.1	3.4	3.5	4.1	.	.	37.5
507	5	3.3	4.4	3.6	4.2	.	.	43.4
508	5	5.1	7.3	3.0	7.3	92	96	42.2
509	5	3.6	4.2	2.1	5.2	57	96	33.0
510	5	2.2	4.4	3.0	4.4	26	82	32.8
511	5	3.3	4.3	3.0	4.1	42	76	34.6
512	5	3.4	4.7	4.3	4.7	50	36	50.4
513	5	3.9	4.7	3.6	2.5	46	82	37.8
514	5	3.6	4.6	5.1	9.5	67	97	48.0
515	5	5.7	6.7	7.3	9.5	23	50	50.0
516	4	3.3	5.2	2.5	3.6	.	.	41.5
517	4	3.0	4.5	2.1	7.1	.	.	50.8
518	4	3.6	3.9	3.4	4.5	.	.	27.5
519	4	3.3	4.6	1.7	3.7	69	53	34.2
520	4	2.3	3.2	3.3	4.2	80	16	48.4
521	4	3.1	3.4	2.5	3.3	53	56	50.7
522	4	3.1	4.9	4.3	5.6	96	94	31.9
523	4	5.1	9.1	8.1	8.7	.	.	48.1
524	4	3.3	4.6	1.9	4.2	80	93	33.8
525	4	2.3	3.3	3.3	2.7	41	59	29.8
526	4	3.7	5.2	3.5	4.2	26	32	39.2
527	4	3.4	4.5	4.1	5.6	48	88	39.0
528	4	4.3	4.7	5.6	7.1	66	99	45.3
529	4	3.2	3.9	2.5	3.6	.	.	29.3
530	4	3.1	4.6	4.6	6.1	.	.	42.2
531	4	2.8	3.3	2.0	3.3	59	96	47.6
532	4	2.7	4.6	1.6	3.5	48	41	34.7
533	4	2.6	3.3	1.7	3.5	.	.	26.5
534	4	2.7	3.2	2.5	4.4	45	26	29.1
535	4	3.0	4.2	2.6	4.3	45	32	29.4
536	4	4.6	6.0	3.4	7.5	89	75	38.9
537	3	1.5	3.4	0.5	2.5	0	11	27.1
538	3	2.5	4.2	1.2	6.3	25	34	29.6
539	3	1.7	4.2	2.1	6.3	.	.	29.6
540	3	2.3	2.3	2.1	3.0	25	58	31.2
541	3	2.4	2.8	1.4	2.3	98	99	29.0
542	3	2.6	2.5	1.5	2.1	89	95	32.3
543	3	2.3	3.1	1.6	3.0	41	10	32.3
544	3	3.0	3.7	2.3	3.3	99	44	37.2
545	3	2.6	3.9	1.7	2.5	89	84	33.4
546	3	1.6	4.3	1.3	4.1	76	34	30.9
547	3	3.9	4.7	3.7	7.2	92	64	29.0
548	3	1.6	1.6	1.3	1.7	92	70	28.0
549	3	2.6	5.0	1.3	4.5	15	23	39.0
550	3	2.7	4.6	2.1	4.5	58	2	50.8

The SAS System

OBS	GRADE	PREVOC	POSTVOC	PRECOMP	POSTCOMP	PREERAS	POSTERAS	AR
551	3	3.4	6.6	1.7	7.9	55	48	29.3
552	5	3.1	4.7	2.6	8.2	67	36	26.6
553	5	3.9	5.3	3.0	6.2	53	8	31.7
554	5	4.5	5.3	4.7	8.2	64	57	33.1
555	5	5.1	7.3	4.2	9.5	82	67	37.8
556	5	5.7	7.3	4.4	5.5	73	70	35.2
557	5	3.3	2.6	3.6	1.8	.	.	45.4
558	5	5.4	2.8	6.5	3.3	70	76	38.1
559	5	6.1	1.7	6.5	2.0	.	.	28.5
560	5	5.7	8.3	8.6	6.8	17	3	44.2
561	5	1.6	3.4	2.3	3.3	84	89	31.2
562	5	3.3	4.2	2.7	4.5	.	.	34.9
563	5	3.4	4.2	2.6	3.6	73	50	26.5
564	5	4.3	4.6	2.3	4.7	17	15	30.0
565	4	2.9	4.3	3.2	5.1	18	69	27.4
566	4	1.9	4.4	2.4	4.7	66	78	35.8
567	4	3.0	4.3	2.0	4.2	89	94	39.4
568	4	3.7	5.3	2.6	5.5	78	88	44.7
569	4	3.4	5.5	2.7	2.5	96	12	32.7
570	4	2.9	4.4	4.6	4.2	.	.	32.1
571	4	3.2	4.5	3.6	5.6	.	.	35.9
572	4	4.3	6.7	3.4	4.6	62	66	49.4
573	4	2.6	2.0	2.0	2.6	.	.	44.4
574	4	2.8	4.3	2.7	4.3	48	18	35.2
575	4	3.6	4.4	2.5	4.2	59	45	31.5
576	4	3.5	3.5	2.6	2.5	68	89	32.1
577	4	4.7	5.2	3.4	4.6	20	26	28.4
578	4	5.2	5.5	5.1	10.1	91	86	46.5
579	4	5.2	5.3	5.2	6.1	13	9	45.7
580	4	3.1	3.5	2.3	4.2	62	95	33.2
581	4	3.0	3.5	2.6	5.2	35	48	34.7
582	4	6.0	5.2	5.6	6.4	89	26	44.3
583	3	2.2	3.0	1.7	2.0	48	79	36.8
584	3	2.4	3.1	2.3	2.5	41	61	36.3
585	3	3.0	3.5	1.6	3.5	64	73	31.5
586	3	2.2	2.6	2.5	2.7	89	95	42.9
587	3	2.8	3.6	2.2	3.7	73	89	45.1
588	3	2.6	3.6	2.1	3.1	73	67	38.4
589	3	1.6	2.4	1.7	3.1	.	.	34.2
590	3	2.6	3.6	2.2	3.4	.	.	27.5
591	3	2.0	3.4	1.3	2.0	94	23	28.6
592	3	2.0	2.4	1.7	3.0	34	17	32.2
593	3	2.2	2.0	1.7	1.9	61	0	50.4
594	3	2.4	2.6	2.0	2.5	41	75	36.1
595	3	5.5	6.1	3.1	6.3	31	91	33.4
596	3	2.2	4.2	1.3	5.3	3	28	38.5
597	3	1.5	2.4	2.4	2.7	67	61	49.7
598	3	2.4	3.2	2.6	4.5	73	58	34.7
599	3	3.9	5.0	3.2	4.5	76	67	33.1
600	3	2.8	3.2	2.3	3.7	28	25	29.0

The SAS System

OBS	GRADE	PREVOC	POSTVOC	PRECOMP	POSTCOMP	PREERAS	POSTERAS	AR
601	3	3.2	3.0	2.5	3.2	38	48	27.5
602	3	4.7	4.6	5.3	7.5	48	25	46.2
603	5	7.3	5.5	10.7	7.4	99	92	31.3
604	5	6.7	6.5	10.3	7.8	89	98	.4
605	5	8.0	5.5	6.8	6.4	89	70	29.0
606	5	4.2	4.2	4.6	6.7	26	29	29.3
607	5	5.0	3.9	2.7	3.6	17	13	30.5
608	4	5.2	4.9	4.3	5.1	0	.	28.4
609	4	6.3	6.3	5.4	6.4	.	.	32.5
610	4	5.5	6.6	10.7	10.1	20	80	26.1
611	5	4.5	5.4	4.2	6.2	.	.	52.1
612	5	2.4	5.6	2.4	5.3	.	.	68.8
613	5	3.1	3.4	2.2	4.5	.	.	71.3
614	5	2.6	3.6	2.4	2.6	.	.	53.2
615	5	4.1	4.6	4.7	5.7	.	.	68.7
616	5	4.8	5.4	5.3	8.6	.	.	67.3
617	5	2.8	3.9	3.4	4.1	.	.	70.1
618	5	4.4	4.7	3.6	6.5	.	.	56.3
619	4	2.6	3.5	1.7	3.7	53	62	51.7
620	4	4.3	4.4	2.4	5.4	38	35	54.0
621	4	3.5	4.4	3.3	6.4	62	89	58.7
622	4	3.5	4.9	1.6	4.4	80	83	74.1
623	4	2.9	3.9	2.6	5.1	85	59	54.5
624	4	6.6	6.6	13.0	8.1	.	.	70.7
625	4	5.5	6.0	10.1	10.1	72	72	51.0
626	5	2.8	4.4	4.2	6.3	.	.	66.4
627	4	1.7	3.2	2.2	3.0	.	.	56.5
628	3	4.4	6.7	4.2	10.4	.	.	65.6
629	3	2.6	3.3	2.5	3.2	.	.	63.2
630	3	2.6	3.6	3.7	4.6	79	58	62.4
631	3	3.0	4.6	2.6	5.6	84	61	71.6
632	3	1.7	3.2	2.7	5.4	81	89	55.2
633	4	4.2	5.3	2.4	4.1	48	45	55.9
634	5	4.3	4.7	7.0	7.7	96	98	58.6
635	5	7.0	9.5	9.7	11.7	99	96	71.5
636	5	2.6	4.3	2.5	4.7	39	42	61.7
637	5	3.5	5.0	4.6	4.5	89	67	68.1
638	5	3.6	4.6	4.5	4.3	57	82	65.6
639	4	2.6	3.3	3.7	4.3	.	.	57.0
640	4	3.9	4.7	2.5	4.1	.	.	55.5
641	4	4.4	5.1	3.3	6.1	.	.	51.8
642	4	3.1	4.6	3.3	4.5	28	78	69.1
643	4	3.3	4.4	3.7	8.7	46	41	56.7
644	4	4.7	5.3	4.4	10.1	95	91	59.5
645	4	2.1	2.6	2.2	3.5	59	94	71.2
646	4	2.7	3.5	2.6	3.7	72	88	64.5
647	4	3.5	4.5	2.5	4.2	66	94	60.4
648	4	1.7	3.4	3.6	3.7	.	.	66.6
649	4	2.4	3.9	3.2	4.5	94	62	64.0
650	4	4.2	4.6	4.6	5.2	83	78	56.2

The SAS System

OBS	GRADE	PREVOC	POSTVOC	PRECOMP	POSTCOMP	PREERAS	POSTERAS	AR
651	4	4.3	3.9	4.6	5.1	75	62	54.2
652	3	1.4	3.2	1.2	1.7	92	96	55.7
653	3	2.2	2.1	1.6	3.1	64	76	57.2
654	3	2.2	3.2	1.5	2.3	0	92	61.8
655	3	2.6	3.6	1.6	3.2	11	80	63.9
656	3	3.7	4.2	1.7	6.3	55	44	57.3
657	5	6.7	6.5	5.5	9.5	87	97	58.3
658	5	4.5	2.2	4.7	3.2	94	53	52.7
659	5	3.1	3.3	2.2	3.2	50	54	53.3
660	5	4.6	4.6	3.2	4.6	70	36	70.5
661	5	4.6	3.7	3.2	3.5	94	96	54.2
662	5	4.6	5.1	3.3	4.6	70	89	66.9
663	5	4.4	4.4	4.5	6.2	67	91	62.6
664	3	1.9	2.4	1.2	1.5	.	.	54.4
665	3	2.4	2.8	2.6	2.6	67	89	60.8
666	3	3.4	4.7	4.1	10.6	79	81	66.0
667	4	3.5	3.5	3.3	7.1	10	98	62.3
668	5	7.1	8.9	7.0	8.2	.	.	85.5
669	5	3.6	4.3	3.6	4.4	.	.	78.2
670	4	5.6	6.0	4.3	5.2	86	78	76.0
671	4	5.2	5.5	7.1	8.7	.	.	82.5
672	5	6.5	7.3	5.3	7.6	.	.	84.1
673	5	5.2	8.3	4.1	9.2	.	.	86.6
674	5	2.8	5.0	5.3	6.3	.	.	80.6
675	5	4.3	4.8	3.6	7.6	.	.	90.0
676	5	4.5	5.4	2.5	5.3	.	.	90.0
677	5	4.6	6.5	5.1	7.6	.	.	88.9
678	5	4.6	6.5	7.0	13.0	.	.	88.2
679	5	5.2	5.8	6.5	9.2	.	.	92.6
680	5	4.8	5.2	5.3	6.5	.	.	87.9
681	5	3.6	4.8	5.1	9.7	.	.	85.0
682	5	2.8	4.8	5.1	5.8	.	.	85.7
683	5	4.2	4.2	4.4	7.0	.	.	93.6
684	5	5.6	7.0	5.8	9.2	.	.	93.9
685	5	3.0	6.3	5.1	6.5	.	.	80.1
686	4	2.5	3.0	1.6	3.2	.	.	87.7
687	3	3.9	5.5	4.3	8.7	.	.	87.5
688	3	1.9	3.7	2.2	7.1	28	31	93.3
689	3	2.2	2.6	2.5	2.7	.	.	76.0
690	3	1.9	2.7	1.3	2.1	.	.	83.0
691	5	4.5	4.7	4.2	5.4	39	92	83.3
692	4	3.9	3.6	2.3	4.6	.	.	93.7
693	4	3.3	4.6	3.4	4.6	.	.	77.8
694	4	4.4	5.7	2.5	7.5	.	.	76.0
695	4	5.2	5.5	10.7	7.1	.	.	87.1
696	4	3.6	4.4	3.6	5.2	.	.	76.4
697	4	4.6	5.5	2.5	4.2	53	88	77.7
698	4	4.5	5.5	3.2	4.5	75	80	91.1
699	4	3.3	4.5	2.4	3.6	.	.	90.6
700	4	3.5	6.6	3.3	6.4	5	23	96.1

The SAS System

OBS	GRADE	PREVOC	POSTVOC	PRECOMP	POSTCOMP	PREERAS	POSTERAS	AR
701	3	3.3	4.3	1.2	4.7	.	.	77.5
702	5	5.1	6.5	5.5	6.8	57	89	89.2
703	5	5.0	5.5	5.1	7.3	.	.	169.4
704	5	3.1	3.4	3.0	6.5	.	.	115.2
705	5	7.9	7.6	9.7	13.0	.	.	117.0
706	4	1.9	3.3	1.6	2.0	20	59	131.8
707	5	4.3	4.2	2.8	3.5	.	.	166.3
708	5	4.3	6.3	3.2	7.6	.	.	128.3
709	5	4.4	2.5	4.8	3.5	.	.	181.5
710	5	4.3	4.6	4.1	4.5	.	.	177.4
711	4	3.5	4.5	4.3	5.6	56	78	161.0
712	4	5.3	6.5	4.6	9.5	98	86	159.0
713	4	4.1	4.2	4.2	5.6	.	.	129.1
714	4	3.6	5.4	3.0	7.4	.	.	154.6
715	4	3.6	6.5	2.6	6.2	32	35	108.9
716	3	3.9	4.6	4.1	7.9	67	64	138.3
717	3	2.8	4.2	2.2	5.3	0	100	111.2
718	3	2.5	3.7	1.5	3.5	51	34	107.1
719	3	2.4	3.9	1.3	4.1	.	.	138.1
720	3	3.3	4.3	2.3	7.9	94	67	136.5
721	3	1.8	3.1	1.3	2.3	67	23	107.2
722	4	7.1	9.1	8.7	8.7	.	.	121.9
723	4	7.1	6.6	10.7	13.0	89	78	138.2
724	4	4.3	4.6	4.5	6.4	.	.	103.9
725	4	4.5	4.9	3.2	4.5	.	.	101.0
726	4	5.2	5.6	6.1	8.7	.	.	106.6
727	5	3.6	4.4	3.0	5.4	97	99	111.7
728	5	3.9	4.7	4.7	8.6	3	64	114.0
729	5	4.3	5.1	7.7	7.7	57	94	170.2
730	5	6.7	9.5	6.5	13.0	79	70	156.3
731	5	5.0	6.1	5.4	7.3	98	84	160.1
732	5	4.6	6.7	5.7	13.0	67	53	113.0
733	3	2.3	3.0	2.2	2.2	.	.	130.1
734	3	2.7	2.2	2.1	2.8	.	.	120.4
735	3	2.4	3.6	2.6	7.1	97	81	136.3
736	3	2.7	4.2	2.3	5.2	.	.	354.5
737	3	2.5	3.2	2.4	5.2	96	94	157.2
738	3	2.2	2.8	2.7	3.4	.	.	142.1
739	3	2.7	2.4	2.0	3.0	.	.	133.3
740	3	1.7	2.6	2.1	2.3	64	31	158.6
741	3	4.9	6.7	7.1	5.2	91	73	102.8
742	3	4.2	6.2	7.7	8.7	81	115	179.9
743	3	2.7	3.6	3.0	4.5	99	84	163.0
744	3	2.6	3.5	2.2	5.2	.	.	197.5
745	3	2.4	3.2	1.7	3.5	81	61	213.5
746	3	3.4	4.3	6.3	2.6	.	.	172.8
747	4	4.2	4.8	2.7	2.7	.	.	118.3
748	4	5.1	5.7	5.1	9.5	94	38	160.3
749	4	3.3	4.6	3.4	5.1	53	72	129.9
750	4	5.7	9.5	7.4	10.5	72	32	184.3

The SAS System

OBS	GRADE	PREVOC	POSTVOC	PRECOMP	POSTCOMP	PREERAS	POSTERAS	AR
751	4	4.6	5.7	5.1	9.5	2	59	115.7
752	4	4.5	9.5	5.6	10.5	91	23	444.0
753	4	3.7	4.8	3.5	7.8	72	48	127.2
754	4	4.2	6.2	4.6	5.4	.	.	119.2
755	3	1.7	2.5	2.5	2.3	31	55	76.8

APPENDIX B

SAS COMMANDS

```
  options nodate ls=72;
  data score1;
    infile "a:\ar1.dat";
    input id school grade prevoc postvoc precomp postcomp preeras
posteras ar;
  run;

  data score2;
    infile "a:\ar2.dat";
    input id school grade prevoc postvoc precomp postcomp preeras
posteras ar;
  run;

  data score;
    set score1 score2;
  run;

  data new;
    set score;
    diffvoc= postvoc-prevoc;
    diffcomp= postcomp-precomp;
    differas= posteras-preeras;

    if (ar<=20) then type=1;
    if (20<ar<=74) then type=2;
    if (ar>74) then type=3;

    if (grade=3) and (prevoc<3.0) then preredv =1;
    if (grade=3) and (prevoc>=3.0) then preredv =2;

    if (grade=3) and (postvoc<3.0) then postredv =1;
    if (grade=3) and (postvoc>=3.0) then postredv =2;

    if (grade=4) and (prevoc<4.0) then preredv =1;
    if (grade=4) and (prevoc>=4.0) then preredv =2;

    if (grade=4) and (postvoc<4.0) then postredv =1;
    if (grade=4) and (postvoc>=4.0) then postredv =2;

    if (grade=5) and (prevoc<5.0) then preredv =1;
    if (grade=5) and (prevoc>=5.0) then preredv =2;

    if (grade=5) and (postvoc<5.0) then postredv =1;
    if (grade=5) and (postvoc>=5.0) then postredv =2;

    if (grade=3) and (precomp<3.0) then preredc =1;
    if (grade=3) and (precomp>=3.0) then preredc =2;

    if (grade=3) and (postcomp<3.0) then postredc =1;
    if (grade=3) and (postcomp>=3.0) then postredc =2;
```

```
if (grade=4) and (precomp<4.0) then prereadc =1;
if (grade=4) and (precomp>=4.0) then prereadc =2;

if (grade=4) and (postcomp<4.0) then postreadc =1;
if (grade=4) and (postcomp>=4.0) then postreadc =2;

if (grade=5) and (precomp<5.0) then prereadc =1;
if (grade=5) and (precomp>=5.0) then prereadc =2;

if (grade=5) and (postcomp<5.0) then postreadc =1;
if (grade=5) and (postcomp>=5.0) then postreadc =2;


   grade    = 'grade level'
   prevoc   = 'vocabulary development score of pretest'
   postvoc  = 'vocabulary development score of posttest'
   precomp  = 'reading comprehension score of pretest'
   postcomp = 'reading comprehension score of posttest'
   preeras  = 'elementary reading attitude score of pretest'
   posteras = 'elementary reading attitude score of posttest'
   diffvoc  = 'the difference of the vocabulary score'
   diffcomp = 'the difference of the comprehension score'
   differas = 'the difference of the eras score'
   ar       = 'accelerated reader program'
   type     = 'ar usage level'
   preredv  = 'type of reader of pre-vocab'
   postredv = 'type of reader of post-vocab'
   prereadc = 'type of reader of pre-comp'
   postreadc = 'type of reader of post-comp';

      value grade     3 = 'third grade'
                      4 = 'fourth grade'
                      5 = 'fifth grade';
      value type      1 = '0<=ar<=20'
                      2 = '20<ar<=74'
                      3 = 'ar>74';
      value preredv   1 = 'below grade level'
                      2 = 'on and above grade level';
      value postredv  1 = 'below grade level'
                      2 = 'on and above grade level';
      value prereadc  1 = 'below grade level'
                      2 = 'on and above grade level';
      value postreadc 1 = 'below grade level'
                      2 = 'on and above grade level';

   run;

/* proc print data=new;
     var diffvoc diffcomp differas ar preredv postredv prereadc
postreadc;
   run;*/
```

```
   proc means data=new n nmiss min max mean std;
     var prevoc postvoc precomp postcomp preeras posteras ar
diffvoc diffcomp differas;
   run;

   proc freq data=new;
     tables type*grade/chisq cmh;
     title '3x3 table for ar usage and grade level';
   run;

   proc freq data=new;
     tables grade*preredv*postredv;
     title '3x2x2 table grade in type of reader of pre-post
vocab';
   run;

   proc freq data=new;
     tables grade*preredc*postredc;
     title '3x2x2 table grade in type of reader of pre-post
comp';
   run;

   proc glm;
     class type grade;
     model diffvoc diffcomp =type|grade/nouni;
     contrast 'below vs(aver&above)' type 2 -1 -1;
     contrast 'below vs average' type 1 -1 0;
     contrast 'below vs above' type 1 0-1;
     contrast 'average vs above' type 0 1 -1;
     contrast 'grade3 vs grade4' grade 1 -1 0;
     contrast 'grade3 vs grade5' grade 1 0-1;
     contrast 'grade4 vs grade5' grade 0 1 -1;
     manova h= type*grade type grade /printe printh;
     title 'manova for vocab and compre';
   run;

   proc glm;
     class type grade;
     model differas=type|grade;
     contrast 'below vs(aver&above)' type 2 -1 -1;
     contrast 'below vs average' type 1 -1 0;
     contrast 'below vs above' type 1 0-1;
     contrast 'average vs above' type 0 1 -1;
     contrast 'grade3 vs grade4' grade 1 -1 0;
     contrast 'grade3 vs grade5' grade 1 0-1;
     contrast 'grade4 vs grade5' grade 0 1 -1;
     title 'anova for eras';
   run;

   proc means noprint data=new;
     class type grade;
     var diffvoc diffcomp differas;
```

```
  output out= carol mean =meanvoc meancomp meaneras;
run;

data carol1;
  set carol;
  proc print data=carol1;
  title'mean for ar data';
run;
```

APPENDIX C

OUTPUT: MEAN FOR AR DATA

MEAN FOR AR DATA

Variable	Label	N	Nmiss
PREVOC	vocabulary development score of pretest	755	0
POSTVOC	vocabulary development score of posttest	755	0
PRECOMP	reading comprehension score of pretest	755	0
POSTCOMP	reading comprehension score of posttest	755	0
PREERAS	elementary reading attitude score of pre	520	235
POSTERAS	elementary reading attitude score of pos	519	236
AR	accelerated reader program	755	0
DIFFVOC	the difference of the vocabulary score	755	0
DIFFCOMP	the difference of the comprehension scor	755	0
DIFFERAS	the difference of the eras score	519	236

Variable	Label	Minimum
PREVOC	vocabulary development score of pretest	1.2000000
POSTVOC	vocabulary development score of posttest	1.4000000
PRECOMP	reading comprehension score of pretest	0.5000000
POSTCOMP	reading comprehension score of posttest	0.3000000
PREERAS	elementary reading attitude score of pre	0
POSTERAS	elementary reading attitude score of pos	0
AR	accelerated reader program	0
DIFFVOC	the difference of the vocabulary score	-4.4000000
DIFFCOMP	the difference of the comprehension scor	-5.7000000
DIFFERAS	the difference of the eras score	-87.0000000

Variable	Label	Maximum
PREVOC	vocabulary development score of pretest	10.7000000
POSTVOC	vocabulary development score of posttest	9.5000000
PRECOMP	reading comprehension score of pretest	13.0000000
POSTCOMP	reading comprehension score of posttest	13.0000000
PREERAS	elementary reading attitude score of pre	99.0000000
POSTERAS	elementary reading attitude score of pos	115.0000000
AR	accelerated reader program	444.0000000
DIFFVOC	the difference of the vocabulary score	5.0000000
DIFFCOMP	the difference of the comprehension scor	10.3000000
DIFFERAS	the difference of the eras score	100.0000000

MEAN FOR AR DATA (continued)

Variable	Label	Mean
PREVOC	vocabulary development score of pretest	3.4112583
POSTVOC	vocabulary development score of posttest	4.1299338
PRECOMP	reading comprehension score of pretest	3.2776556
POSTCOMP	reading comprehension score of posttest	4.4777483
PREERAS	elementary reading attitude score of pre	59.2076923
POSTERAS	elementary reading attitude score of pos	58.0828516
AR	accelerated reader program	32.6475497
DIFFVOC	the difference of the vocabulary score	0.7186755
DIFFCOMP	the difference of the comprehension scor	1.2000927
DIFFERAS	the difference of the eras score	-1.2389210

Variable	Label	Std Dev
PREVOC	vocabulary development score of pretest	1.2601284
POSTVOC	vocabulary development score of posttest	1.4071641
PRECOMP	reading comprehension score of pretest	1.7700957
POSTCOMP	reading comprehension score of posttest	2.2102325
PREERAS	elementary reading attitude score of pre	28.2370767
POSTERAS	elementary reading attitude score of pos	28.7893909
AR	accelerated reader program	41.4303222
DIFFVOC	the difference of the vocabulary score	1.0331679
DIFFCOMP	the difference of the comprehension scor	1.7110822
DIFFERAS	the difference of the eras score	28.6867779

APPENDIX D

MEAN AND STANDARD DEVIATION:

VOCABULARY, COMPREHENSION, AND ERAS

MEAN AND STANDARD DEVIATION: VOCABULARY, COMPREHENSION, AND ERAS

Variable	N	Nmiss	Maximum	Minimum	Mean
PREVOC	755	0	10.7000000	1.2000000	3.4112583
POSTVOC	755	0	9.5000000	1.4000000	4.1299338
PRECOMP	755	0	13.0000000	0.5000000	3.2776556
POSTCOMP	755	0	13.0000000	0.3000000	4.4777483
PREERAS	520	235	99.0000000	0	59.2076923
POSTERAS	519	236	115.0000000	0	58.0828516
AR	755	0	444.0000000	0	32.6475497
DIFFVOC	755	0	5.0000000	-4.4000000	0.7186755
DIFFCOMP	755	0	10.3000000	-5.7000000	1.2000927
DIFFERAS	519	236	100.0000000	-87.0000000	-1.2389210

Variable	Std Dev
PREVOC	1.2601284
POSTVOC	1.4071641
PRECOMP	1.7700957
POSTCOMP	2.2102325
PREERAS	28.2370767
POSTERAS	28.7893909
AR	41.4303222
DIFFVOC	1.0331679
DIFFCOMP	1.7110822
DIFFERAS	28.6867779

APPENDIX E

TYPE OF AR USAGE AND TYPE OF READER FOR POST-VOCABULARY AND COMPREHENSION

TYPE OF AR USAGE AND TYPE OF READER
FOR POST-VOCABULARY

Type of AR Usage Frequency Percent Row Percent Column Percent	Type of Reader: Below Grade Level	Type of Reader: On/Above Grade Level	Total
1: Low AR Usage	254 33.63 64.96 61.65	137 18.15 35.04 39.34	391 51.79
2: Average AR Usage	136 18.01 49.45 33.01	139 18.41 50.55 40.52	275 36.42
3: High AR Usage	22 2.91 24.72 5.34	67 8.87 75.28 19.53	89 11.79
Total	412 54.57	343 45.43	755 100.00

TYPE OF AR USAGE AND TYPE OF READER
FOR POST-COMPREHENSION

Type of AR Usage Frequency Percent Row Percent Column Percent	Type of Reader: Below Grade Level	Type of Reader: On/Above Grade Level	Total
1: Low AR Usage	252 33.38 64.45 65.45	139 18.41 35.55 37.57	391 51.79
2: Average AR Usage	117 15.50 42.55 30.39	158 20.93 57.45 42.70	275 36.42
3: High AR Usage	16 2.12 17.98 4.16	73 9.67 82.02 19.73	89 11.79
Total	385 50.99	370 49.01	755 100.00

APPENDIX F

3 X 3 TABLE FOR TYPE OF AR USAGE AND GRADE LEVEL

3 x 3 TABLE FOR TYPE OF AR USAGE AND GRADE LEVEL

Type of AR Usage Frequency Percent Row Pct Col Pct	Grade 3	Grade 4	Grade 5	Total
1: Low AR Usage	69 9.14 17.65 41.57	154 20.40 39.39 51.85	168 22.25 42.97 57.53	391 51.79
2: Average AR Usage	71 9.40 25.82 42.77	111 14.70 40.36 37.37	93 12.32 33.82 31.85	275 36.42
3: High AR Usage	26 3.44 29.21 15.66	32 4.24 35.96 10.77	31 4.11 34.83 10.62	89 11.79
Total	166 21.99	297 39.34	292 38.68	755 100.00

APPENDIX G

3 X 2 X 2 TABLES FOR GRADE LEVELS THREE - FIVE

IN TYPE OF READER OF PRE-POST VOCABULARY

PREED1 BY POSTRED1
CONTROLLING FOR GRADE 3

PRERED1 (TYPE OF READER OF PRE-VOCAB)
POSTRED1 (TYPE OF READER OF POST-VOCAB)

Frequency Percent Row Percent Col Percent	1	2	Total
1	60 36.14 44.78 100.00	74 44.58 55.22 69.81	134 80.72
2	0 0.00 0.00 0.00	32 19.28 100.00 30.19	32 19.28
Total	60 36.14	106 63.86	166 100.00

PREED1 BY POSTRED1
CONTROLLING FOR GRADE 4

PRERED1 (TYPE OF READER OF PRE-VOCAB)
POSTRED1 (TYPE OF READER OF POST-VOCAB)

Frequency Percent Row Percent Col Percent	1	2	Total
1	150 50.51 66.67 98.04	75 25.25 33.33 52.08	225 75.76
2	3 1.01 4.17 1.96	69 23.23 95.83 47.92	72 24.24
Total	153 51.52	144 48.48	297 100.00

PREED1 BY POSTRED1
CONTROLLING FOR GRADE 5

PRERED1 (TYPE OF READER OF PRE-VOCAB)
POSTRED1 (TYPE OF READER OF POST-VOCAB)

Frequency Percent Row Percent Col Percent	1	2	Total
1	182 62.33 80.89 91.46	43 14.73 19.11 46.24	225 75.76
2	17 5.82 25.37 8.54	50 17.12 74.63 53.76	72 24.24
Total	199 68.15	93 31.85	297 100.00

APPENDIX H

3 X 2 X 2 TABLES FOR GRADE LEVELS THREE - FIVE IN TYPE OF READER OF PRE-POST COMPREHENSION

PRERED2 BY POSTRED2
CONTROLLING FOR GRADE 3

PRERED2(TYPE OF READER OF PRE-COMP)
POSTRED2(TYPE OF READER OF POST-COMP)

Frequency Percent Row Percent Col Percent	1	2	Total
1	69 41.57 50.36 97.18	68 40.96 49.64 71.58	137 82.53
2	2 1.20 6.90 2.82	27 16.27 93.10 28.42	29 17.47
Total	71 42.77	95 57.23	166 100.00

PRERED2 BY POSTRED2
CONTROLLING FOR GRADE 4

PRERED2(TYPE OF READER OF PRE-COMP)
POSTRED2(TYPE OF READER OF POST-COMP)

Frequency Percent Row Percent Col Percent	1	2	Total
1	141 47.47 58.75 98.60	99 33.33 41.25 64.29	240 80.81
2	2 0.67 3.51 1.40	55 18.52 96.49 35.71	57 19.19
Total	143 48.15	154 51.85	297 100.00

PRERED2 BY POSTRED2
CONTROLLING FOR GRADE 5

PRERED2(TYPE OF READER OF PRE-COMP)
POSTRED2(TYPE OF READER OF POST-COMP)

Frequency Percent Row Percent Col Percent	1	2	Total
1	159 54.45 70.35 92.98	67 22.95 29.65 55.37	226 77.40
2	12 4.11 18.18 7.02	54 18.49 81.82 44.63	66 22.60
Total	171 58.56	121 41.44	292 100.00

APPENDIX I

GENERAL LINEAR MODELS PROCEDURE

FOR

MULTIVARIATE ANALYSIS OF VARIANCE:

TYPE

GRADE

TYPE X GRADE

manova for vocab, compre

General Linear Models Procedure
Class Level Information

Class	Levels	Values
TYPE	3	1 2 3
GRADE	3	3 4 5

Number of observations in data set = 755

E = Error SS&CP Matrix

	DIFFVOC	DIFFCOMP
DIFFVOC	745.02404035	449.38396318
DIFFCOMP	449.38396318	2033.7053408

General Linear Models Procedure
Multivariate Analysis of Variance

Partial Correlation Coefficients from the Error SS&CP Matrix
Prob > |r|

DF = 746	DIFFVOC	DIFFCOMP
DIFFVOC	1.000000 0.0001	0.365080 0.0001
DIFFCOMP	0.365080 0.0001	1.000000 0.0001

General Linear Models Procedure
Multivariate Analysis of Variance

Characteristic Roots and Vectors of: E Inverse * H, where
H = Type III SS&CP Matrix for TYPE E = Error SS&CP Matrix

Characteristic Root	Percent	Characteristic Vector V'EV=1	
		DIFFVOC	DIFFCOMP
0.06060840	99.97	0.00884155	0.01965399
0.00001922	0.03	0.03834677	-0.01345546

Manova Test Criteria and F Approximations for
the Hypothesis of no Overall TYPE Effect
H = Type III SS&CP Matrix for TYPE E = Error SS&CP Matrix

S=2 M=-0.5 N=371.5

Statistic	Value	F	Num DF	Den DF	Pr > F
Wilks' Lambda	0.94283694	11.126	4	1490	0.0001
Pillai's Trace	0.057164158	10.9748	4	1492	0.0001
Hotelling-Lawley Trace	0.060627622	11.2767	4	1488	0.0001
Roy's Greatest Root	0.060608401	22.6069	2	746	0.0001

NOTE: F Statistic for Roy's Greatest Root is an upper bound.
NOTE: F Statistic for Wilks' Lambda is exact.

H = Type III SS&CP Matrix for GRADE

	DIFFVOC	DIFFCOMP
DIFFVOC	13.180149932	2.263094492
DIFFCOMP	2.263094492	0.4657911266

Characteristic Roots and Vectors of: E Inverse * H, where
H = Type III SS&CP Matrix for GRADE E = Error SS&CP Matrix

Characteristic Root	Percent	Characteristic Vector V'EV=1	
		DIFFVOC	DIFFCOMP
0.01908620	99.79	0.03915770	-0.00644693
0.00004060	0.21	-0.00391436	0.02292959

Manova Test Criteria and F Approximations for
the Hypothesis of no Overall GRADE Effect
H = Type III SS&CP Matrix for GRADE E = Error SS&CP Matrix

S=2 M=-0.5 N=371.5

Statistic	Value	F	Num DF	Den DF	Pr > F
Wilks' Lambda	0.981231423	3.54564	4	1490	0.0069
Pillai's Trace	0.018769338	3.53364	4	1492	0.0071
Hotelling-Lawley Trace	0.0191268	3.55758	4	1488	0.0068
Roy's Greatest Root	0.0190862	7.11915	2	746	0.0009

NOTE: F Statistic for Roy's Greatest Root is an upper bound.
NOTE: F Statistic for Wilks' Lambda is exact.

General Linear Models Procedure
Multivariate Analysis of Variance

H = Type III SS&CP Matrix for TYPE*GRADE

	DIFFVOC	DIFFCOMP
DIFFVOC	5.4455354969	10.234709431
DIFFCOMP	10.234709431	21.079430486

Characteristic Roots and Vectors of: E Inverse * H, where
H = Type III SS&CP Matrix for TYPE*GRADE E = Error SS&CP Matrix

Characteristic Root	Percent	Characteristic Vector V'EV=1	
		DIFFVOC	DIFFCOMP
0.01278978	95.54	0.01754974	0.01596953
0.00059774	4.46	-0.03522293	0.01767210

Manova Test Criteria and F Approximations for
the Hypothesis of no Overall TYPE*GRADE Effect
H = Type III SS&CP Matrix for TYPE*GRADE E = Error SS&CP Matrix

S=2 M=0.5 N=371.5

Statistic	Value	F	Num DF	Den DF	Pr > F
Wilks' Lambda	0.986781896	1.24327	8	1490	0.2698
Pillai's Trace	0.013225648	1.2415	8	1492	0.2708
Hotelling-Lawley Trace	0.013387518	1.24504	8	1488	0.2688
Roy's Greatest Root	0.012789775	2.38529	4	746	0.0499

NOTE: F Statistic for Roy's Greatest Root is an upper bound.
NOTE: F Statistic for Wilks' Lambda is exact.

H = Type III SS&CP Matrix for TYPE

	DIFFVOC	DIFFCOMP
DIFFVOC	14.419797235	41.062860454
DIFFCOMP	41.062860454	117.03967295

APPENDIX J

GENERAL LINEAR MODELS PROCEDURE

FOR

DEPENDENT VARIABLES: DIFFVOC AND DIFFCOMP

General Linear Models Procedure

Dependent Variable: DIFFVOC the difference of the vocabulary score

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	4	54.377100	13.594275	13.59	0.0001
Error	750	750.469576	1.000626		
Corrected Total	754	804.846675			

R-Square	C.V.	Root MSE	DIFFVOC Mean
0.067562	139.1884	1.0003	0.7187

Source	DF	Type I SS	Mean Square	F Value	Pr > F
TYPE	2	21.844461	10.922231	10.92	0.0001
GRADE	2	32.532639	16.266319	16.26	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
TYPE	2	17.434410	8.717205	8.71	0.0002
GRADE	2	32.532639	16.266319	16.26	0.0001

Contrast	DF	Contrast SS	Mean Square	F Value	Pr > F
below vs (average&ab	1	16.407319	16.407319	16.40	0.0001

General Linear Models Procedure

Dependent Variable: DIFFCOMP the difference of the comprehension scor

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	4	152.77812	38.19453	13.94	0.0001
Error	750	2054.78477	2.73971		
Corrected Total	754	2207.56289			

R-Square	C.V.	Root MSE	DIFFCOMP Mean
0.069207	137.9233	1.6552	1.2001

Source	DF	Type I SS	Mean Square	F Value	Pr > F
TYPE	2	141.78250	70.89125	25.88	0.0001
GRADE	2	10.99562	5.49781	2.01	0.1352

Source	DF	Type III SS	Mean Square	F Value	Pr > F
TYPE	2	133.56713	66.78357	24.38	0.0001
GRADE	2	10.99562	5.49781	2.01	0.1352

Contrast	DF	Contrast SS	Mean Square	F Value	Pr > F
below vs (average&ab	1	127.47854	127.47854	46.53	0.0001

APPENDIX K

GENERAL LINEAR MODELS PROCEDURE

FOR

ANALYSIS OF VARIANCE: ERAS

DIFFERENCE IN ERAS

TYPE

GRADE

TYPE X GRADE

Number of observations in data set = 755

Group	Obs	Dependent Variables
1	519	DIFFERAS
2	755	DIFFVOC DIFFCOMP

NOTE: Variables in each group are consistent with respect to the presence or absence of missing values.

anova for eras

General Linear Models Procedure

Dependent Variable: DIFFERAS the difference of the eras score

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	8	12445.707	1555.713	1.92	0.0554
Error	510	413832.667	811.437		
Corrected Total	518	426278.374			

R-Square	C.V.	Root MSE	DIFFERAS Mean
0.029196	-2299.237	28.486	-1.2389

Source	DF	Type I SS	Mean Square	F Value	Pr > F
TYPE	2	3172.9031	1586.4516	1.96	0.1426
GRADE	2	5978.3876	2989.1938	3.68	0.0258
TYPE*GRADE	4	3294.4158	823.6039	1.01	0.3990

Source	DF	Type III SS	Mean Square	F Value	Pr > F
TYPE	2	5790.4712	2895.2356	3.57	0.0289
GRADE	2	4775.0857	2387.5428	2.94	0.0536
TYPE*GRADE	4	3294.4158	823.6039	1.01	

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Southeastern Virginia County - site of dissertation testing

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